Studies in the History of Arabic Logic

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CONTENTS

		Page
	Preface	7
	Introduction	11
I.	Arabic Logic: A Brief Account	13
II.	Al-Fārābī on Logical Tradition	21
III.	Al-Kindī's Sketch of Aristotle's Organon	28
IV.	Al-Farabī on the Question: Is Existence a Predicate?	39
V.	An Interpretation of Aristotle's Doctrine of Future Contingency and Excluded Middle	43
VI.	A Tenth-Century Arab-Christian Apologia for Logic	55
VII.	The Logic-Chapter of Muhammad ibn Ahmad al-Khwārizmī's Encyclopedia, *Keys to the Sciences*	64
VIII.	Avicenna on the Logic of "Conditional" Propositions	76
IX.	Abū-'l-Ṣalt of Denia on Modal Syllogisms	87
X.	Averroes' *Quaesitum* on Assertoric (Absolute) Propositions	91
	Index	107

PREFACE

I am well aware that these studies illuminate only a few pages of the thick volume of Arabic work in logic. But it seems to me important to make a start in shifting this great mass of scholarly effort out of the realm of *terra incognita.*

Several of the studies published here have previously appeared in learned journals, as follows:

"Al-Farabī on Logical Tradition," *Journal of the History of Ideas*, vol. 24 (1963), pp. 127–132.

"Al-Kindi's Sketch of Aristotle's Organon," *The New Scholasticism*, vol. 37 (1963), pp. 44–58.

"Al-Farabī on: 'Is Existence a Predicate?'," *Journal of the History of Ideas*, vol. 21 (1960), pp. 428–430.

"The Logic-Chapter of Muhammad ibn Ahmad al-Khwarizmī's Encyclopedia, *Keys to the Sciences* (*c.* A.D. 980)," *Archiv fur Geschichte der Philosophie*, vol. 44 (1962), pp. 62–74.

"Avicenna on the Logic of 'Conditional' Propositions," *Notre Dame Journal of Formal Logic*, vol. 4 (1963), pp. 48–58.

"Averroes' *Quaesitum* on Assertoric (Absolute) Propositions," *Journal of the History of Philosophy*, vol. 1 (1963).

These articles are reprinted in this volume substantially unchanged, but with some minor additions and corrections. I wish to thank the editors of the journals involved for their permission to reprint this material.

I am grateful to Miss Dorothy Henle for her conscientious diligence in preparing the typescript.

The papers brought together in this volume are part of a series of studies of Arabic contributions to logic supported by a grant from the National Science Foundation, which has facilitated both the accomplishment of the work, and its publication. It affords me great pleasure to record my sincere thanks for this assistance.

Nicholas Rescher.

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INTRODUCTION

Although the study of Arabic philosophy and science has gained enormous ground in the past century, Arabic logic has fared comparatively badly. Very few Arabists have concerned themselves with logical texts and ideas—and even these few have had only rather incidental interests in this domain. As a result, the great mass of material that represents the logical work of the Arabic-speaking peoples remains pretty much *terra incognita*. This situation presents a natural challenge to interested scholars.

In 1959 the National Science Foundation kindly awarded the writer a research grant—renewed in 1961—to pursue an investigation of Arabic logic with a view to producing a systematic and synoptic account of its historical development. The outcome of these researches is now nearly ready for publication in a book delineating *The Development of Arabic Logic*, which is to be published by the University of Pittsburgh Press in 1964. In the course of this investigation it seemed appropriate to pause from time to time to undertake a more detailed study of some particular text or idea that came to view. The papers gathered together here are all studies which originated in this way.

To be sure, these studies do but little to illuminate the vast area of Arabic logic. None the less, it has seemed advisable to make conveniently available at least a sampling of the kind of work that must be done on a vastly extended scale if we are ever to attain a reasonably secure and comprehensive knowledge of Arabic logic, capable of comparison with that of, say, Arabic mathematics or medicine.

The materials to be presented fall into ten chapters, as follows:

I. Arabic Logic: A Brief Account.
II. Al-Fārābī on Logical Tradition.
III. Al-Kindī's Sketch of Aristotle's Organon.
IV. Al-Fārābi on the Question: Is Existence a Predicate?
V. An Interpretation of Aristotle's Doctrine of Future Contingency and Excluded Middle.
VI. A Tenth-Century Arab-Christian Apologia for Logic.
VII. The Logic-Chapter of Muhammad ibn Aḥmad al-Khwārizmī's Encyclopedia, *Keys to the Sciences*.
VIII. Avicenna on the Logic of "Conditional" Propositions.
IX. Abū-'l-Salt of Denia on Modal Syllogisms.
X. Averroes' *Quaesitum* on Assertoric (Absolute) Propositions.

Six of these studies have appeared as articles in learned journals. (See the Preface for detailed citations.) Four papers—numbers I, V, VI, and IX—are here published for the first time.

Chapters II–X deal with selected special topics in the history of Arabic logic. The first chapter, presenting a "Brief History" of Arabic logic, is of a different character. Written especially for this volume, this historical survey presents the requisite background for the more specialized studies that follow. Each of the contributors to Arabic logic subsequently dealt with is here put into his proper context in the historical development of the subject.

While it is hoped that these studies will provide information useful to the historian of philosophy and the student of the intellectual history of Islam, their author hopes fondly that their perusal will provide an incentive to others to carry further the work which he has here taken in hand and has carried forward, as he knows full well, but very little.

I

ARABIC LOGIC: A BRIEF ACCOUNT

I. *Introduction*

Arabic logic, like the rest of medieval Arabic science and philosophy, is entirely Western and has nothing to do with "Oriental Philosophy." It developed wholly in the wake of the classical Greek tradition as preserved in, and transmitted through Hellenistic Aristotelianism. The present account traces briefly the evolution of Arabic logic from its inception in the late 8th century to its stultification in the 16th century, mentioning only the most important trends, contributors, and achievements. Individual writers will be identified by reference to Carl Brockelmann's monumental *Geschichte der Arabischen Litteratur* (cited as GAL).

II. *Transmission of Greek Logic to the Arabs*

After their conquest of Syria-Iraq, the Arabs came into contact with Greek learning as this continued to be nursed by various Christian sects—primarily the Nestorians and the Monophysites or Jacobites—who had transplanted thence (*via* such centers as Edessa and Nisibis) the Hellenistic scholarship of Alexandria. Thus the first writers on logic in Arabic were Syrian Christian scholars; and their tradition of logical studies—including a close link between logic and medicine—was transmitted into an Arabic-language setting, and laid the foundation for the development of Arabic logic.

The Syriac expositors of Aristotelian logic arrived at the following standard arrangement of logical works: *Isagoge* (Porphyry), *Categoriae*, *De Interpretatione*, *Analytica Priora*, *Analytica Posteriora*, *Topica*, *Sophistici Elenchi*, *Rhetorica*, and *Poetica*. These nine works were thought of as dealing with nine respective *distinct branches* of logic, each based upon its canonical text. This construction of Aristotelian logic was taken over by the Arabs, resulting in the following organization of the subject matter of logic:

Branch	*Arabic Name*	*Basic Text*
(1) "Introduction"	*al-īsāghūji*	*Isagoge* (Porphyry)
(2) Categories	*al-maqulat*	*Categoriae*
(3) Hermeneutics	*al-'ibārah*	*De Interpretatione*
(4) Analytics	*al-qiyās*	*Analytica Priora*

Branch	*Arabic Name*	*Basic Text*
(5) Apodictics	*al-burhān*	*Analytica Posteriora*
(6) Topics	*al-jadal*	*Topica*
(7) Sophistics	*al-mughalṭah* (or *al-safsaṭah*)	*Sophistici Elenchi*
(8) Rhetoric	*al-khiṭabah*	*Rhetorica*
(9) Poetics	*al-shi'r*	*Poetica*

The totality of this Organon was referred to as "the nine books" of logic, or as "the eight books" with the *Poetica* (or sometimes *Isagoge*) excluded. The first four of these logical treatises (which apparently were the only ones translated into Syriac prior to A.D. 800 and into Arabic prior to 850) were called "the four books" of logic. These "four books" constituted the object of logical studies in the basic curriculum of the Syrian academies.

Several of the books of this Aristotelian canon were put into Arabic in the first part of the 9th century, usually from Syriac translations but sometimes directly from the Greek. These translations proved unsatisfactory and were revised or replaced by scholars trained by the outstanding Nestorian translator Ḥunain ibn Isḥāq (808–877; GAL, I, 205–206).

These Arabic translations of Aristotle's logical treatises, and of several Greek studies or commentaries upon them, prepared the ground for the first indigenous Arabic writer on logic, the philosopher al-Kindī (*c.* 805–873; GAL, I, 209–210), whose logical writings, however, probably amounted to little more than summaries of the writings of others about the Aristotelian texts. Although very little material has survived, some inferences regarding the character of this earliest phase of Arabic logic are possible on the basis of data in the logic-chapter of the encyclopedia of the Persian polymath Muḥammad ibn Aḥmad al-Khwārizmī (*c.* 930–990; GAL, I, 244).

III. *The "School of Baghdad"*

In the late 9th and throughout the 10th century, Arabic logic was virtually the monopoly of a single "school" of logicians centered at Baghdad. The founders of this school belonged to a close-knit group of Syrian scholars, including the teachers of Abū Bishr Mattā ibn Yūnus and the teachers of these teachers. Its principal continuators were the pupils of Abū Bishr's pupil Yaḥya ibn 'Adī and the pupils of these pupils. Virtually all of these men—with the notable exception of al-Fārābī, a born Muslim—were Nestorian Christians.

Abū Bishr Mattā ibn Yūnus (*c.* 870–940; GAL, I, 207) was the first specialist in logical studies to write in Arabic. He completed the work of

the disciples of Ḥunain ibn Isḥaq by making the first Arabic translations of *Posterior Analytics* and *Poetics*, and he also translated several Greek commentaries on Aristotelian works (e.g. Themistius on *Posterior Analytics*). Abū Bishr was not only a translator but wrote logical commentaries and treatises of his own, which have unfortunately not survived.

Abū Naṣr al-Fārābī (*c.* 870–950; GAL, I, 210–213) was perhaps the most important logician of Islam. His commentaries, only a fraction of which survive, covered the entire Aristotelian Organon in great detail. All later Arabic logicians—even those who, like Avicenna, are opposed to his influence—see Aristotle through his eyes. Aside from his logical commentaries, al-Fārābī wrote numerous treatises on special subjects whose character can now be determined only with tantalizing indirection.

Yaḥyā ibn ʿAdī (893–974; GAL, I, 207), who studied logic and philosophy with both of the preceding scholars, is important not only as a translator of Greek works from Syriac into Arabic, but also as a most influential teacher of logic: virtually half of the Arabic logicians of the 10th century are his pupils. Nor was he a mere pedagogue; he wrote various independent works, including a commentary on *Prior Analytics*, virtually none of which have survived. Yaḥyā's pupil ʿĪsā ibn Zurʿah (942–1008; GAL, I, 208) was especially important as a teacher who continued his tradition, as well as a translator and commentator.

The principal achievements of this "School of Baghdad" are primarily three. (1) Completion of the series of Arabic translations of Greek logical works commenced by the school of Ḥunain ibn Isḥāq. (2) The masterly commentaries of al-Farabī (and possibly some others) on the logical treatises of Aristotle. And (3) the elaborate study of certain extra-Aristotelian topics by Abū Bishr Matta and al-Farabī (e.g. the theory of "conditional" (hypothetical and disjunctive) syllogisms, the logic of inductive reasoning). But quite aside from any specific contribution, the School of Baghdad must be credited with completing and realizing the work—only commenced by the school of Ḥunain—of establishing Greek logic in the Arabic speaking orbit.

The School of Baghdad died a natural death of old age around 1050, when—perhaps for political reasons—the Christian community of Iraq withdrew into itself, and occupied itself with other than philosophico-scientific matters. The last productive member of the School was the important Nestorian scholar and theologian Ibn al-Ṭayyib (*c.* 980–1043; GAL, I, 482–483), a pupil of ʿĪsa ibn Zurʿah.

IV. *Avicenna and his Influence*

Despite the demise of the School of Baghdad, the ultimate survival of logical studies in Islam was assured by the fact that logic had, through

the mediation of medicine, become an integral constituent of the Arabic philosophico-medical tradition as inherited from the Syrian Christians. From a quantitative standpoint, the 11th century was a low ebb in the history of Arabic logic. Yet this period of dearth produced one of the greatest, and perhaps the most creative logician of Islam, the great Persian scholar Avicenna, i.e., Abū 'Alī ibn Sīnā (980–1037; GAL, I, 452–458).

Avicenna made a daring innovation. Although greatly indebted to it, he had nothing but contempt for the School of Baghdad, which conceived of logic as the study of the Aristotelian texts. Avicenna disapproved of this orientation towards the text rather than the subject. For him, and for the mainstream of tradition dominated by him, a logic-book is no longer a commentary on Aristotle, but an independent, self-sufficient treatise or handbook that covers the ground after its own fashion. Avicenna's unrivalled masterpiece is a series of treatises in his monumental *Kitāb al-shifā'* dealing with the nine parts of the Arabic logical Organon.

Avicenna styled his own work in logic (and philosophy) "Eastern" in deliberate contrast with the "Western" approach of the School of Baghdad. This "Eastern" logic espoused by Avicenna differs from that of, say, al-Fārābī little if at all in substance, and only minorly in matters of emphasis and in willingness to depart from Aristotelian precedent. Thus Avicenna imports into his logic a certain amount of material derived perhaps from Galen, certainly from Stoic sources (for example, quantification of the predicate of categorical propositions, elaboration of quality and quantity for "conditional" propositions, a treatment of singular propositions in the manner of the Stoics).

Avicenna's call to study logic from independent treatises rather than *via* the Aristotelian texts met with complete success in Eastern Islam, where after the demise of the School of Baghdad, the formal study of Aristotle's logical writings came to an end. (This abandonment of Aristotle may have been a requisite for the survival of Greek logic in Islam; a discipline that demanded study of works of an alien philosopher could probably not have survived.) Only in Muslim Spain did the tradition of Aristotelian studies of the School of Baghdad manage—for a time—to survive.

V. *The Logicians of al-Andalus (Muslim Spain)*

During the late 11th and the 12th century, Spain was the principal center of logical studies in Islam. Muḥammad ibn 'Abdūn (*c.* 930–990; Suter, *Mathematiker*, no. 161; not in GAL), a Spanish Muslim who studied medicine and philosophy in Baghdad, was instrumental in transplanting to Cordova the traditions of the School of Baghdad in

the study of Aristotelian logic. They stayed alive for over two and one-half centuries in the logico-medical tradition of al-Andalus, where they survived well past their extinction in Eastern Islam.

Abū-'l-Salt (1067–1134; GAL, I, 486–487) wrote an influential logic-compendium which follows al-Fārābī closely. The detailed study of the writings of Aristotle *via* the commentaries of al-Fārābī was revitalized by Ibn Bajjah (Avenpace) (*c.* 1090–1138; GAL, I, 460), who wrote an important series (extant but unpublished) of discussions of Aristotle's works based on al-Fārābī's commentaries.

Ibn Rushd or *Averroes* (1126–1198; GAL, I, 461–462) was unquestionably the most important of the Arabic logicians of Spain. In the midst of a busy public career as an official and as personal physician to an Almohad caliph, he wrote a monumental series of philosophical commentaries, as well as several important works in other fields. His elaborate commentaries on the treatises of the logical Organon rival (and conceivably surpass) those of al-Farabī in their detailed understanding of Aristotle's logic. In any case, Averroes stands—as he considered himself to stand—heir to the masters of the School of Baghdad and successor to the heritage of al-Fārābī.

After Averroes, the logical tradition of Muslim Spain entered a period of decline punctuated by the productions of at best competent but sterile handbook-writers such as Ibn Ṭumlūs (*c.* 1160–1223; GAL, I, 463), and Ibn Sab'īn (1218–1270; GAL, I, 465–466), the last identifiable writer on logic of al-Andalus. Arabic logic became extinct in Spain due to the fact that here—unlike Eastern Islam, where logic achieved a *modus vivendi* with religious orthodoxy—popular and theological hostility towards logic and philosophy as an integral part of "alien learning" continued unabated.

The principal achievement of Muslim Spain in the field of logic was to keep alive into the 13th century the tradition of the study of Aristotelian logic of the School of Baghdad. Its pinnacle was reached in the work of Averroes, whose magisterial expositions of Aristotle's logic were its greatest triumph.

VI. *The Quarrel of the "Eastern" and "Western" Schools in the 13th Century*

Avicenna's criticisms of the School of Baghdad, and his shift away from Aristotelian orthodoxy, were not received with universal acceptance. A "Western" school arose to oppose Avicenna's innovations. Its principal exponents were the prolific Persian scholar Fakhr-al-Dīn al-Rāzī (1148–1209; GAL, I, 506–508) and his followers al-Khūnajī (1194–1249; GAL, I, 463) and al-Urmawī (1198–1283; GAL, I, 467). These logicians not only offered detailed criticisms of Avicenna's departures from Aristotle, but wrote handbooks of logic that became

standard textbooks, not only during the lifetime of their "school," but even beyond.

Opposed to these "Westerners," the school of the "Easterners," which supported Avicenna, continued active throughout the 13th century. Its leading exponent was the eminent and versatile Persian scholar Kamāl-al-Dīn ibn Yūnus (1156–1242; GAL, SI, 859). His position was supported by his pupils al-Abharī (1200–1264; GAL, I, 464–465) and Nasīr-al-Dīn al-Ṭūsī (1201–1274; GAL, I, 508–512), as well as the pupils of this last-named scholar, especially the prolific logician al-Qazwīnī al-Kātibī (*c.* 1220–1280; GAL, I, 466–467). These logicians produced polemical treatises to attack the theses of the "Westerners," as well as textbooks and handbooks to facilitate the teaching of logic according to their conceptions.

Amidst this disputation and textbook-writing, the logical treatises of Aristotle were lost sight of completely. In effect, Avicenna carried the field before him—in Eastern Islam Aristotle's logical writings were utterly abandoned. Ibn Khaldūn (b. 1322) could lament that "the books and methods of the ancients are avoided, as if they had never been, although they are full of the results and useful aspects of logic." The handbooks of the two 13th century "schools" provided the basis for all future study in Islam, completely replacing the works of Aristotle. But very little produced at this stage has any significance for logic as a science rather than a field of instruction.

VII. *The Final Period*

The period 1300–1500 may be characterized as the final period of Arabic logic, when its ossification becomes complete. It is a time, not of creative logicians, but of teachers of logic writing expository commentaries and super-commentaries on the 13th century handbooks, now basic to all Arabic instruction in logic.

A crucial occurrence underlying this development was the effort of al-Tustarī (*c.* 1270–1330; GAL, SI, 816) and his disciple al-Taḥtānī (*c.* 1291–1365; GAL, II, 209–210) to effect an arbitration between the "Eastern" and "Western" schools. As a result, later Arabic logicians were free to draw on both sectors of the tradition and to use the handbooks of both schools for the teaching of logic. Throughout 15th and 16th century Islam, the study of logic was based upon certain standard 14th century commentaries on the 13th century handbooks; in particular the commentaries of al-Taḥtānī himself, his pupils Ibn Mubārakshāh (*c.* 1310–1375; GAL, SII, 297), and al-Taftazānī (1322–1390; GAL, II, 215–216), and the pupil or associate of these two, 'Alī ibn Muḥammad al-Jurjānī (1340–1413; GAL, II, 216–217). A flood of glosses and super-commentaries on the commentaries of these scholars

on the logic-handbooks of the 13th century marks the final, disintegrative phase of the evolution of logic in Islam.

VIII. *Logic and Islamic Religion*

As Arabic logic increasingly disassociated itself from philosophy and medicine and—taking up a closer affinity with legal, philological, and theological studies—gradually made its way into the curriculum of the Islamic higher school (*madrasah*) beginning in the 13th century, its mode of instruction was assimilated to that of religious and legal training. The student did not "learn logic" as such; he learned texts. The mode of instruction is this: the student *memorizes* a brief handbook, and the teacher *comments* upon it at greater length. Hence the popularity of short logic-manuals and the proliferation of commentaries and supercommentaries upon them.

The ability of Greek logic to overcome—at any rate in Eastern Islam—the antipathy inherent in the doctrinaire Muslim conceptions about "alien learning," and to establish itself in the very citadels of its opponents, bears remarkable witness at once to the astonishing vitality of logic as an intellectual discipline, and to the great assimilative genius of the Islamic peoples. But logic had to pay a price, for in the wake of its acceptance by Islam, the science itself atrophied, falling increasingly into the hands of schoolmasters concerned with the passive assimilation of texts rather than a living grasp of ideas and technique.

IX. *Bibliography*

A complete bibliography of Arabic logic can be found in Nicholas Rescher, *The Development of Arabic Logic* (Pittsburgh, 1964). An informative account of the transmission of Greek logic to the Arabs is given in Max Meyerhof, "Von Alexandrien nach Baghdad," *Sitzungsberichte der Preussischen Akademie der Wissenschaften* (Philosophisch-historische Klasse), vol. 23 (1930). The conflict between logic and Islamic religion is detailed in Ignaz Goldziher, "Stellung der Alten Islamischen Orthodoxie zu den Antiken Wissenschaften," *Abhandlungen der Koniglich Preussischen Akademie der Wissenschaften* (Philosophisch-historische Klasse), Jahrgang 1915 (Berlin, 1916). For the knowledge of Aristotle's logical works among the Arabs see the article ARISṬŪ (= Aristotle) by Richard Walzer in the 1960 edition of the *Encyclopedia of Islam* (Volume I), and Ibrahim Madkour, *L'Organon d'Aristote dans le Monde Arabe* (Paris, 1934). The article MANṬIḲ (by T. J. de Boer) in the *Encyclopedia of Islam* (first edition) provides some information.

Some representative Arabic logical texts accessible in European languages are: Translations by D. M. Dunlop of several logical *opuscula* of al-Farabī published in *The Islamic Quarterly*, vol. 2 (1955)–vol. 5

(1959). Nicholas Rescher, *Al-Farabī's Short Commentary on Aristotle's "Prior Analytics"* (Pittsburgh, 1963). A. M. Goichon, *Avicenne: Livre de Directives et Remarques* (Paris, 1951). Mohammad Achena and Henri Massé, *Avicenne: Le Livre de Science*, vol. I (Paris, 1955). Angel Gonzalez Palencia, *Abusalt: Rectificatión de la mente* (Madrid, 1915). *Aristotelis Opera cum Averrois Commentariis*, Venice 1550 and following (the edition of 1562–1574 was reprinted photographically in Frankfurt am Main in 1962). Miguel Asín Palacios, *Introduccion al Arte de la Logica por Abentomlus de Alcira*, part I, all published (Madrid, 1916). Edwin E. Calverly, "Al-Abharī's *Īsaghūjī fi-'l-mantiq*," *The D.B. Macdonald Presentation Volume* (Princeton, 1933). Aloys Sprenger, translation of the *Risalah al-shamsiyyah* of al-Qazwīnī al-Katibī in *A Dictionary of the Technical Terms Used in the Sciences of the Musulmans* (Calcutta, 1862). J. D. Luciani, *Al-Akhdari: Le Soullam, Traite de Logique* (Algiers, 1921).

The substantive study of the contributions of Arabic logicians has only begun to get under way. A few data are given in Carl Prantl, *Geschichte der Logik im Abendlande*, vol. II (Leipzig, 1861; 2nd. edition 1885, photo-reprinted 1956).

II

AL-FĀRĀBĪ ON LOGICAL TRADITION

I. *Introduction*

Although Abū Nasr al-Fārabī (*c.* 873–950) has always been recognized as one of the most important philosophers of Islam, his full stature is coming to be appreciated only recently, as his numerous works are gradually being published and studied.[1] Al-Fārābī devoted more effort to logic than to any other single branch of philosophy or science,[2] and he deserves to be classified as the first specialist in logical studies among the Arabic-speaking peoples.[3] Much of his logical work survives and is beginning to attract the attention of scholars,[4] although a great deal of work remains to be done. For regrettably, al-Fārabī's logic has attracted a disproportionately small amount of attention as contrasted with his writings on other seemingly more alluring subjects such as politics and religion.

I wish in this chapter to present a perhaps unique discussion by al-Fārabī on the subject of the history of logical studies. This discussion possesses especial interest because it sheds important light on how al-Fārabī viewed the continuity of the logical tradition from the Athens of Aristotle to the Baghdad of his own day.

The text with which I am concerned is actually one of the first of al-Fārabī's writings to see the light of print in the original Arabic.[5] In his classic monograph on al-Fārabī published in 1869,[6] Moritz Steinschneider printed (in an Appendix) the Arabic text of two substantial extracts from the logical writings of al-Fārabī as quoted from the great

[1] For a survey of published work by and about al-Farabi see N. Rescher, *Al-Farabī: An Annotated Bibliography*, Pittsburgh (University of Pittsburgh Press) 1962.

[2] See Ahmet Ateş, "Farabi bibliografyasi," *Turk Tarih Kurumu Belleten* (Ankara), vol. 15 (1951), pp. 175–192.

[3] N. Rescher, *The Development of Arabic Logic* (Pittsburgh, 1964).

[4] The important contributions of D. M. Dunlop call for especial mention: "Al-Fārabī's Introductory Sections on Logic," *The Islamic Quarterly*, vol. 2 (1955), pp. 264–282; "Al-Farabi's *Eisagoge*," *ibid.*, vol. 3 (1956), pp. 117–138; "Al-Fārabī's Paraphrase of the *Categories* of Aristotle," *ibid.*, vol. 4 (1958), pp. 168–197, and vol. 5 (1959), pp. 21–54.

[5] In fact, it is the first but for two treatises by al-Farabī published by F. A. Schmoelders in his *Documenta Philosophiae Arabum* (Bonn, 1836).

[6] "Al-Farabi (Alpharabius): Des Arabischen Philosophen Leben und Schriften," *Mémoires de l'Académie Impériale des Sciences de St. Pétersbourg*, VIIe serie, vol. 13, no. 4 (St. Pétersbourg, 1869).

medical history of Ibn Abī Usaibi'ah.[7] The first of these extracts is taken from the section on logic of al-Farabī's *Iḥṣa' al-'ulum* ("Inventory of the Sciences") long familiar in its medieval Latin form as *De Scientiis* first published in Venice in 1546,[8] and of late available in a magisterial edition by M. Alonso.[9] But it is with the second of the two extracts that we shall now be concerned.

The text with which we shall be dealing is an excerpt from al-Fārābī's treatise "On the Appearance of Philosophy,"[10] and is, so far as we know, the only part of this work to survive. About half of this text was translated into German and discussed by Max Meyerhof in his superb study of the movement of Greek philosophy and science from Alexandria to Baghdad.[11] Although the present discussion thus, to some extent, inevitably overlaps that of Meyerhof, our interest is quite different from Meyerhof's problem of how Greek learning reached the Arabs. Instead, our objective is to examine al-Fārābī's discussion with a view to the information it provides regarding the history of logical studies in Islam itself. The ensuing two sections of this paper will present a translation of al-Fārābī's discussion, followed by a survey of the principal materials which it affords to the historian of logic.

II. *A Fragment from al-Fārābī's Treatise "On the Appearance of Philosophy"*[12]

Abu Naṣr al-Farabī relates in [his treatise] "On the Appearance of Philosophy" (*fī zuhūr al-falsafah*) that whose substance is this. He says that instruction in philosophy became widespread in the days of the Greek kings, and after the death of Aristotle [was pursued] at Alex-

[7] *'Uyun al-anba' fī tabaqat al-atibba'* ("The sources of information about the classes of physicians"). Steinschneider gives the texts on pp. 208–209 and pp. 211–213. They became available in a markedly superior version when the work of Ibn Abī Usaibi'ah was edited by August Müller, vol. 1, Cairo, 1882 (text only), vol. 2 Konigsberg, 1884 (notes).

[8] *Avicennae compendium de anima . . . Ab Andrea Alpago ex arabico in latinum versa.* Venetiis, 1546. Pp. 1436–1446 give a Latin translation of al-Farabi's treatise, erroneously attributed to Avicenna.

[9] Manuel Alonso Alonso (ed.), *Domingo Gundisalvo (tr.): De Scientiis* (Madrid, 1954).

[10] So-called by Ibn Abī Usaibi'ah: *fī-zuhur al-falsafah.* But this may well be identical with the treatise known to the Arabic bibliographers as *Kitab fī ism al-falsafah wa-sabab zuhuri-ha* (On the name of "philosophy" and on the cause of its appearance). (See the bibliography of Ateş.)

[11] Max Meyerhof, "Von Alexandrien nach Baghdad: Ein Beitrag zur Geschichte des philosophischen und medizinischen Unterrichts bei den Arabern," *Sitzungsberichte der Preussischen Akademie der Wissenschaften, Philosophisch-Historische Klasse,* Berlin, 1930, pp. 389–429. For our text see pp. 393–394 and 405–406. And see also Meyerhof's paper on "La Fin de l'École d'Alexandrie d'apres quelques Auteurs Arabes," *Bulletin de l'Institut d'Égypte,* vol. 15 (1932–1933), pp. 109–123 (especially pp. 114–118).

[12] From the Arabic text of Ibn Abī Usaibi'ah, *'Uyun al-anba' fī tabaqat al-aṭibbā'* (Die Reihen der Ärtzte"), ed. August Müller, vol. 1, Cairo, 1882 (from page 134, line 30 to page 135, line 24).

andria until the end of the days of the woman [Cleopatra?]. And [he said] that after Aristotle died, instruction [in philosophy] remained there [in Alexandria] in the same state until the end of the reign of thirteen kings, during whose reign there were twelve teachers [successively] in charge of philosophical instruction, one of them being known as Andronicus [of Rhodes].

Now the last of these rulers was the woman [i.e. Cleopatra]. But she was conquered by Augustus, the ruler of the Romans, who fought against them [the Greeks in Egypt, presumably] and overpowered their kingdom. When he had established himself, he investigated the (Alexandrian) Library and its facilities. He found in it copies of the books of Aristotle which had been copied in his (Aristotle's) days and in the days of Theophrastus. He also found that the teachers and philosophers had written books about the subjects with which Aristotle concerned himself in them (i.e., in his writings). Thus he ordered the copying of these books which had been written down in the days of Aristotle and his pupils, and [he ordered] that there be instruction in these works, and that the rest be abandoned. And he decided upon Andronicus to be in charge of this enterprise. He ordered him (Andronicus) to have copies made for him to take with him to Rome and copies to remain in the place of instruction at Alexandria. And he ordered him to designate some scholar to take his place at Alexandria and himself to come with him to Rome. Thus there came to be instruction [in philosophy] in two places.

Things went along thus until Christianity came. Then the instruction was stopped at Rome, but remained at Alexandria until the Christian king [Constantine?] looked into the matter, and assembled the bishops to deliberate about what should be left alone in this instruction and what should be stopped. They were of the opinion that there should be instruction in the books of logic up to the end of the assertoric [i.e. non-modal] figures and that there be no instruction in what comes after that. The reason for this is that they were of the opinion that in this [latter part of logic] there was harm for Christianity, but that in what they admitted for instruction there was something helpful towards the victory of their religion. Consequently the public (exoteric) part of the instruction remained within this prescribed limit, and whatever was examined of the rest was studied privately, until Islam came a long time afterwards.

Then [i.e., after the rise of Islam] the instruction was moved from Alexandria to Antioch and remained there for a long time until at last but one teacher remained. With him there studied two men, and they moved away taking the books with them. Now one of them was of the people of Harrān, and the other of the people of Marw. As to the one

of the people of Marw, there studied with him two men, one of whom was Ibrahīm al-Marwazī and the other Yuḥannā ibn Ḥailān. With al-Marwazī studied the bishop Isra'īl and Quwairī, both of whom went to Baghdad. Now Ibrahım [sic. in error for Isra'īl] occupied himself with religion, but Quwairī took up instruction. As for Yuḥanna ibn Hailan, he also occupied himself with his [i.e. Christian] religion. Ibrahīm al-Marwazī went down to Baghdad and settled there. With al-Marwazī studied Matta ibn Yūnān [i.e. Abū Bishr Mattā ibn Yunus].

That which was taught [in logic] at that time was up to the end of the assertoric figures [of the syllogism]. But Abu Naṣr al-Fārābī says about himself that he studied with Yūḥannā ibn Ḥailan up to the end of *Anal. Post.* (*kitab al-burhan*). The part [of the two *Analytics*] which comes after the assertoric figures (of the syllogism [i.e. which comes after *Anal. Pr.*, I, 7]) was called "the part which is not read" [i.e. in lecture-curriculum] until [the time when] one read that; for it became standard [in logical study] afterwards. When the matter came to Muslim teachers one read from the assertoric figures as far as a man was able to read. And thus Abū Naṣr [al-Fārābī] says that he himself read [i.e., under a teacher] up to the end of *Anal. Post.*

III. *Al-Farabi's Reports Regarding the History of Logic*

Al-Fārābī divides the historical development of logical studies into five principal eras:

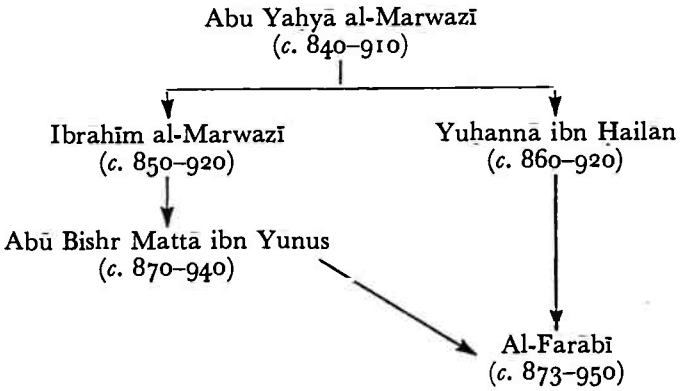
I. Early Greek times (Aristotle and his immediate successors).
II. Alexandrian times prior to a supposed "purification" effected by Augustus.
III. Roman supremacy until the coming of Christianity.
IV. Christian supremacy until the coming of Islam.
V. Islamic times.

Al-Fārābī's information regarding periods I–III is at times mythical in character. One cannot but wonder, for example, about his sources for crediting Augustus for transplanting philosophical and logical studies from Alexandria to Rome under the supervision of Andronicus of Rhodes!

On the other hand, there is every reason to regard as accurate—within its own narrow limits—al-Fārabī's reports about the history of logical studies during periods IV and V. Abundant evidence in support of this view is given in Max Meyerhof's magisterial monograph "Von Alexandrien Nach Baghdad" cited above. We know too from the magnificent researches of G. Bergstrasser how closely Arabic scholarship of the 9th century was linked with Hellenistic medico-philosophical schools of Alexandria, and how much the traditions of Alexandria

lived on in the Syriac milieu in which al-Farābī's teachers were nurtured.[13]

Particular interest attaches to al-Fārābī's account of the personalia of logical studies in Islam, and especially his own teachers. We are able to supplement his own statements from other sources, with the following result regarding the "genealogy" of master-and-pupil kinship.[14]



All of al-Farabī's teachers are identifiable personages about whose life and work we possess considerable information. We are thus fully and reliably informed regarding the origins of the logico-philosophical "School of Baghdad" which was to be Avicenna's pet aversion a century later.[15] The most curious feature of al-Fārābī's account of how logic came to Islam is its utter silence on the (in fact pre-eminent) role of Ḥunain ibn Isḥāq and his associates in the processes of translation and transmission. I think that this is only partially explained in terms of the egocentric focus upon his own intellectual antecedents, which is so important to establish the "authority" of a teacher in medieval Islam. More important, I believe, is that al-Fārābī does not view logic as a matter of books and documents but as a *living oral tradition* of logical specialization and expertise. From this standpoint of logic viewed as

[13] See especially Gotthelf Bergsträsser, "Hunain ibn Ishaq über die syrischen und arabischen Galen-Übersetzungen," *Abhandlungen fur die Kunde des Morgenlandes*, vol. 17 (1925), no. 2. Hunain is still able to give detailed information about the differences and similarities of programs and practices in philosophico-medical instruction in the Alexandrian institutes and the Nestorian academies of his time.

[14] The tabulation here given lists only the men referred to in al-Farabī's account; a great deal more is known about his own teachers, and those of his principal teacher, Abu Bishr Matta ibn Yūnus. Much of this information is summarized in Max Meyerhof's monograph, "Von Alexandrien Nach Baghdad."

[15] Solomon Pines "La 'Philosophie Orientale' d'Avicenne et sa Polémique contre les Baghdadiens," *Archives d'Histoire Doctrinale et Littéraire du Moyen Age*, vol. 19 (1952), pp. 5–37.

a living discipline of specialized expertise channelled through a continuous oral tradition transmitted from a master to the scholars who "read" the canonical texts under his guidance,[16] it is quite possible that al-Farābi answers the question of "How Greek logic reached the Arabs?" not only correctly, but comprehensively as well.

Unquestionably the most interesting facet of al-Farabī's account is the light it sheds upon the study of Aristotle's logic among the Christian scholars, primarily Nestorians, who carried Greek logic from Alexandria to Baghdad in the 9th century. It has long been recognized that the Christian students of Aristotelian logic in the Syriac and (earliest) Arabic setting broke off their study of "the eight books" of Aristotelian logic (Porphyry's *Isagoge*, *Categoriae*, *De Interpretatione*, *Analytica Priora*, *Analytica Posteriora*, *Topica*, *Soph. Elen.*, *Rhetorica*) in the middle of the *Prior Analytics*, stopping after section 7 of Book I.[17] In consequence of this animus against later parts of the Organon, the transmission of these later works suffered a significant delay. Thus, although the Syriac translation of the basic logical texts commenced around A.D. 600, *Anal. Post.* was not translated into Syriac until around 850 (by Ḥunain ibn Ishaq); and although Arabic translation of the Organon began around 820, *Anal. Post.* was not translated into Arabic until around 900 (by Abū Bishr Mattā ibn Yūnus, the principal teacher of al-Fārābi and founding father of the School of Baghdad). These facts have long been known, but they are greatly clarified by the information provided in al-Fārābī's discussion. It appears that the eastern Christians (especially the Nestorians) took a disapproving view of the epistemology of the *Posterior Analytics*. Aristotle is here concerned to put forward a conception of the nature of scientific knowledge, construing this in terms of deductive inference from "necessary" premisses.[18] But this

[16] Al-Farabī is reported to have "read" Aristotle's *Physics* forty times and his *Rhetoric* two hundred times—a report to which Hegel reacted with the observation that al-Farabī "must have had a strong stomach." (F. Rosenthal, "The Technique and Approach of Muslim Scholarship," *Analecta Orientalia*, vol. 24 (1947), 74 pp.; see p. 4.) This report does not mean that al-Farabī read these works so frequently for his private edification, as Hegel understood it to say, but that he gave regular courses of explanatory lectures on them.

[17] See Moritz Steinschneider, *Die Arabischen Übersetzungen aus dem Griechischen*, in the XII *Beiheft zum Centralblatt fur Bibliothekswesen* (Leipzig, 1893), p. 41. There was explicit disapproval of the later parts of the Organon among these Christian students of Aristotle's logic. Thus St. John of Damascus was outspoken in his disapproval of *Anal. Post.* Cf. Richard Walzer, "New Light on the Arabic Translations of Aristotle," *Oriens*, vol. 6 (1953), pp. 91–142 (see p. 99); reprinted in *Greek into Arabic* (London, 1962)).

[18] For Aristotle, the role of observation and induction is not to validate the ultimate premisses of scientific knowledge, but to give experimental exemplification and substantiation to them. Being definitions, these ultimate premisses require no "external" validation. See the magisterial Introduction of W. D. Ross's, *Aristotle's Prior and*

view leaves no room for revelation or any other specifically religious source of knowledge within the sphere of "scientific knowledge," the sole mode of genuine knowledge, according to Aristotle. It thus came to pass that theological objections to the Aristotelian conception, as advanced in *Anal. Post.*, of an epistemology based on the deductive establishment of necessary conclusions on the basis of necessary premisses, had important consequences for the development of logical studies. It led the Christian professors of philosophy in Alexandria, and their followers in the Syriac-speaking orbit, to a de-emphasis upon *Anal. Post* and its successor works, as well as to virtual abandonment of the entire part of *Anal. Pr.* (after section 7 of Book I) that is devoted to developing the machinery of modal syllogisms, and especially the theory of apodictic inference (which is particularly closely bound-up with the treatment of necessary inference put forward in *Anal. Post.*).[19]

Al-Fārābī's report consequently sheds light upon an interesting and little-known instance of the moulding impact of theological considerations upon the history of logical studies, and thus upon the history of logic itself.[20]

Posterior Analytics (Oxford, 1949). And for the technical details of Aristotle's epistemology of necessary inference in the theory of modal syllogisms see the writer's study of "Aristotle's Theory of Modal Syllogisms and its Interpretation" in M. Bunge (ed.) *The Critical Approach: Essays in Honor of Karl Popper* (Glencoe, The Free Press, 1964). With respect to *Anal. Pr.*, however, it should be noted that the Syriac translation by George, Bishop of the Arabs (d. 724, very old) is unique in being a *complete* rendering of this work into Syriac. (A. Baumstark, *Geschichte der Syrischen Literatur*, Bonn, 1922, p. 257.)

[19] The details of this relationship are demonstrated in the writer's paper cited in the preceding footnote.

[20] Only after completing this study did Isidor Friedmann's Erlangen *Inaugural-Dissertation* come into my hands: *Aristotles' Analytica bei den Syrern*, Berlin, 1898, 39 pp. Providing no data not available from other (though sometimes later) sources, Friedmann does give (on pp. 9–11) a German translation of the initial three-fourths of our text.

III

AL-KINDĪ'S SKETCH OF ARISTOTLE'S ORGANON

I. *Introduction*

Ya'qūb ibn Isḥāq al-Kindī (*c.* 805–873), whose name was Latinized to Alkindus or Alkendus, was born in Basra, the descendent of a noble Arab tribe, the banū Kindah. The only notable Arabic philosopher of pure Arab descent, he was consequently dubbed "the philosopher of the Arabs."[1] Living at a time when, in the Arabic-speaking orbit, knowledge of Greek philosophy and science was almost wholly confined to the Syrian Christians, al-Kindī made an extensive study of Greek learning. A prolific writer, he composed numerous treatises—almost 300 titles are reported—mainly dealing with the natural sciences: mathematics (including music), physics (especially optics), geography, medicine, and others. In addition, al-Kindī made an oblique contribution to learning by acting as a patron and sponsor of Arabic translations of Greek works.

In the present discussion, our sole concern will be with al-Kindī as a logician, or more accurately as a student of logic. For he was, unlike his successor al-Farābī, no specialist in logic. His encyclopedic interests embraced all of Greek science and philosophy, and his concern with logic was derivative in nature, resulting almost as a by-product from the fact that logic was not only an integral but even a fundamental branch of Greek philosophico-scientific knowledge.

From reports in the Arabic bio-bibliographical sources,[2] we learn that al-Kindī wrote commentaries on, or more probably epitomes of, all parts of the Aristotelian Organon as well as the *Isagoge* of Poryphyry, and that he also commented on the commentaries of Alexander of Aphrodisias on the *Rhetorica* and the *Poetica*. This makes al-Kindī the first *writer*, as opposed to translator, on logical subjects in Arabic, if we

[1] The principal studies of al-Kindī, and in particular the important works of Flügel, Nagy, and Guidi-Walzer, are listed in the Bibliography at the end of this chapter. Reference may also be made to C. Brockelmann, *Geschichte der Arabischen Litteratur*, I, 209–210; and Supplement I, 372–374; *The Encyclopedia of Islam*, II, 1021 (L. Massignon); G. Sarton, *Introduction to the History of Science*, I (Baltimore, 1927), 559–560; and Ueberweg-Geyer, *Grundriss der Geschichte der Philosophie*, II (Berlin, 1928), 303–304 and 720.

[2] These data were already brought together in *Flügel* (1857). For references of this form see the Bibliography at the end of this paper.

overlook the questionable case of Ibn al-Muqaffa'.[3] It is a matter which cannot but cause regret to students of the history of logic that none of these logical works of al-Kindī's have survived.

In view of these losses, it is a piece of good fortune that we possess, in Arabic, a treatise by al-Kindī bearing the title "On the quantity of the books of Aristotle and what is needful of them for the attainment of philosophy," the text of which was published by M. Guidi and R. Walzer in 1940.[4] This treatise contains a sketch, amounting to roughly a third of the whole, of Aristotle's Organon which qualifies as *the oldest extant Arabic logical text.*[5] Although this particular discussion of al-Kindī's has but little interest from the standpoint of its substantive logical contents, it is of significant value both for the historian of logic and for the student of intellectual tradition. This combination of index and guide to Aristotle's works was seemingly a standard production of Arabic philosophers of the 850–950 period. We know, for example, that al-Farabī (*c.* 873–950) composed a treatise "On the objectives (or: subject-materials) of Aristotle in each of his treatises" (*Kitāb fī aghad Arisṭūṭalīs fī kull wahid min kutubihi*).[6]

My aim here is to present an English translation of al-Kindī's Arabic text and to prefix to it some discussion both of the structure and substance of al-Kindī's remarks, and of their significance for the history of Arabic logic.

The first point of interest is al-Kindī's conception of the place of logic among the sciences. Following the tradition of the Hellenistic Aristotelianism of Alexandria, he arranges the sciences in the order: mathematics-and-logic, physics, metaphysics, and theology. Logic (and mathematics) are thus regarded as propaedeutic to all scientific

[3] The attribution in Arabic sources of logic-treatises to Abū 'Amr 'Abd-Allah ibn al-Muqaffa' (d. A.D. 759), the famous translator of *Kalīlah wa-Dimnah*, the Persian "Fables of Bidpai," is for various reasons so implausible, that several authorities rejected such works as figments of the imagination of later bio-bibliographers. However, Paul Kraus convincingly argued in 1934 that the logician is the obscure son of this famous author, Muhammad ibn 'Abd-Allah ibn al-Muqaffa' (d. *c.* A.D. 800), and that he wrote (or more probably translated or even caused to be translated?) short epitomes of "the four books" of logic, based on Syriac sources. ("Zu ibn al-Muqaffa'") *Rivista degli Studi Orientali*, vol. 14 (1934), pp. 1–20.

[4] Guidi-Walzer (1940) gives the *editio princeps* of our text, together with an Italian translation. The Arabic text is also printed in *Abu Rīdah* (1950).

[5] This statement requires slight qualification. In two instances the "old" Arabic translations of Aristotelian logical texts—ante-dating the work of Hunain ibn Ishaq and his associates—have survived: that of *Anal. Pr.* by one "Theodore" and that of *Soph. Elen.* by 'Abd-al-Masīh ibn Na'imah al-Himsī. But in these two cases the surviving versions were "modernized" in the school of Hunain. See R. Walzer, "New Light on the Arabic Translations of Aristotle," *Oriens*, vol. 6 (1953), pp. 91–142.

[6] See the Farabī bibliography of Ahmet Ateş in Hilmi Ziya Ülken (ed.) *Fārabī Tetkikleri* (Istanbul Üniversitesi Edebiyat Fakultesi Yayinlarindan: 468) Istanbul, 1950 (see p. 113).

inquiries, and the other disciplines being arranged in order of their decreasing involvement with matter. This ranking follows out ideas of Aristotle himself as laid down in the first chapter of book Eta of the *Metaphysics*. But al-Kindī and his Alexandrian predecessors go beyond Aristotle in regarding this ordering not only as the theoretical ranking of the sciences, but also as representing the didactic ordering of these disciplines for the program of philosophico-scientific studies. This concept of a complete parallelism between the systematic ranking of scientific subjects on the one hand and the didactic ordering of the program of studies on the other is applied by al-Kindī (and the Alexandrians) even to the individual books of the logical Organon.

Following Hellenistic models, al-Kindī regarded the division of the Aristotelian Organon into separate books as reflecting the organization of logic into distinct disciplines. This conception results in the standard Hellenistic-Syriac-Arabic division of logic into eight disciplines, each corresponding to an Aristotelian treatise:

Branch	*Subject-Matter on the Standard Arabic View*	*Subject-Matter According to Al-Kindī*	*Basic Aristotelian Treatise*
(1) Categories	categories (*al-maqulat*)	categories (*al-maqūlāt*)	*Categoriae*
(2) Hermeneutics	interpretation (*al-'ibarah*)	interpretation (*al-tafsīr*)	*De Interpretatione*
(3) Analytics	syllogisms (*al-qiyas*)	conversion (*al-'aks*)	*Analytica Priora*[7]
(4) Apodictics	demonstration (*al-burhan*)	making-certain (*al-īḍāḥ*)[8]	*Analytica Posteriora*
(5) Topics	disputation (*al-jadal*)	dialectical reasoning (*jadliyyah*)	*Topica*
(6) Sophistics	deception (*al-mughalitah*)	deception (*al-mughaliṭah*)	*Sophistici Elenchi*
(7) Rhetoric	rhetoric (*al-khitabah*)	persuasion (*al-balagha*)	*Rhetorica*
(8) Poetics	poetry (*al-shi'r*)	poetry (*al-shi'r*)	*Poetica*

In grouping the *Rhetorica* and *Poetica* into the logical Organon, the Syriac and Arabic tradition follows a practice dating back at least to Simplicius (fl *c.* A.D. 533). It was also customary in Hellenistic-Syriac-

[7] The Syrians and the Arabs of al-Kindī's time confined the study of *Anal. Pr.* to the part ending with section seven of Book I, i.e., to the end of the discussion of categorical syllogisms. On this fact and its reasons see Max Meyerhof, "Von Alexandrien Nach Baghdad," *Sitzungsberichte der Preussischen Akademie der Wissenschaften* (Philosophisch-Historische Klasse), vol. 23 (1930), pp. 389–429.

[8] These terms were evidently closely linked in the 9th century usage. Thus we know that the mathematician Abu Sa'īd Jabir ibn Ibrahīm al-Sabī' wrote a (surviving) work entitled *Īdaḥ al-burhan* ("The making-certain of demonstration"). See H. Suter, *Die Mathematiker und Astronomen der Araber und ihre Werke*; Leipzig, 1900; p. 69 (no. 162).

Arabic practice to prefix to this listing as another branch of logic that of "Introduction" based upon Porphyry's *Isagoge* as its basic text. Al-Kindī, being engaged in giving an inventory of Aristotle's treatises, of course omits this work. His discussion makes it clear that, for al-Kindī, the principal objective of logic as a whole is the study of syllogistic arguments ("unions") in descending degrees of strength that decline from the *demonstrative* arguments of Analytics and Apodictics through the looser, but yet often reliable *dialectical* reasonings of Topics to the deceptive and fallacious arguments treated in Sophistics. How, or even whether, al-Kindī would fit the *Rhetorica* and *Poetica* into this schematism is unclear. His treatment of these treatises is perfunctory at best.

It warrants note that al-Kindī, when characterizing the subject-matter of the various branches of logic, employs a terminology which occasionally (viz. in respect to items 2, 3, 4 and 7) reflects a more primitive Arabic practice than that which was to become standard in the wake of the translations of Hunain ibn Ishaq and his younger associates. It is significant, however, that in the main al-Kindī's approach and his terminology already correspond almost everywhere to the usual Arabic usage of the technical terminology of logic. (Certain exceptions are noted in our footnotes.)

One of the curious features of al-Kindī's discussion is his characterization of "Analytics" (i.e., of *Anal. Pr.* through I, 7, namely to the end of the treatment of categorical syllogisms) as being concerned, not with "the syllogism" as such, but with "the conversion of premisses."[9] His discussion brings out quite clearly the fact that al-Kindī thought of the main point of "Analytics" as being not as much the conception of the syllogism *per se*, but the reducibility of syllogistic arguments—in the main by conversion—to syllogisms of the first figure.

It is interesting to observe al-Kindī's attempts to put the technical terminology of logic to work in his discussion. One instance of this is the use of the technical term "quantity" (*kamiyyah*) in the title of his treatise. Another is his predilection for the technical term "species" (*naw'*) over against some non-technical equivalent that would serve equally well.

The outstanding characteristic of al-Kindī's sketch is its very sketchiness. Only in the case of the first three works of the Aristotelian Organon —the *Categoriae*, *De Interpretatione* and *Analytica Priora*—is there any attempt to go beyond an explanation of the meaning of the title of the treatise to an indication of its contents. Quite strikingly, more than half of al-Kindī's entire discussion of the Organon is devoted to its first

[9] Here also a terminological primitivism occurs—in that al-Kindī calls the pair of premisses of a syllogism its "head," *ra's*.

three books. Everything else is given the most bare and sketchy treatment, but these are dealt with at some length, and some of their contents reported in outline. It seems to me not at all unlikely that, when writing the treatise here under discussion, the "four books of logic," i.e., *Categ.*, *De Interp.* and *Anal. Pr.* (to I, 7), prefixed by Porphyry's *Isagoge*, were the only works of the Arabic logical Organon to which al-Kindī had access in translation or epitome.[10]

Let us now bring our introduction to an end, and turn from the preliminaries to the presentation of al-Kindī's text.

II. *Al-Kindī's Sketch of Aristotle's Organon*

[391: II][11] The books of Aristotle's are listed in the ordering which the student who seeks entry to them needs as an aid, as regards both their sequence and their arrangement, so that he might become a philosopher by their means. After the propaedeutic sciences there are four species of books:

(1) The "set of eight"[12] logical ones.
(2) The physical ones.
(3) Those which are not needed for physics, being by nature different from that which is in need of the material; for there exists alongside of the material that which connects it by one of the species of connection.
(4) Those which have no need for the material and have no connection with it in any way at all.[13]

Now as for the books of logic there are eight of them:

(I) The first of them is called *Categoriae* (*qāṭughūriyās*), and deals with the categories, by which I mean the subject and the predicate. The subject is that which is called a substance; and the predicate is what is called an accident when it is predicated of a substance, but neither by what is attributed to it by its name nor by its definition.

What is called a "predicate" may be of two species:

Firstly, when the predicate is attributed to the subject by its nature

[10] A strikingly similar summary—perhaps taken from al-Kindī—of the books of the Aristotelian Organon is given in the compendium of universal history by Ibn Wādiḥ al-Ya'qubī (d. *c.* 900). See the German version given in M. Klamroth, "Über die Auszüge aus griechischen Schriftstellern bei al-Ja'qūbī," *Zeitschrift der Deutschen Morgenlandischen Gessellschaft*, vol. 41 (1887), pp. 465 f. (see pp. 422–427).

[11] I so indicate the corresponding page of the text edition of *Guidi-Walzer* (1940).

[12] The text mistakenly reads "set of four."

[13] Cf. *Meta.* 1026a 13 and 1069a 30. Essentially this same ordering of the sciences, viz. (i) propadeutics (i.e., grammar and mathematics), (ii) logic, (iii) physics (including music), (iv) metaphysics and (v) theology, dominates the Arabic concept of the ordering of the sciences, and accounts for the tripartite division, logic-physics-metaphysics, of the Arabic philosophical encyclopedias.

and its definition—as, e.g. life is said to belong to man, for "man" is said of a living being, which is defined by the definition, "A living-being is a substance which is sensible and mobile," in order to differentiate it from the things that are different from it. In this sense too is quality said to belong to [i.e., be predicated of] white. For quality is that which pertains to the white, and is said about it. This white thing is similar [in quality] to this white thing; and this white thing is not similar [in quality] to this white thing, [for] this shade is similar to this shade, but this shade is not similar to this shade. It is thus that quality gives the category according to species; the quality of a thing being the species which is predicated of it in virtue of its name and its definition.

Secondly, the other one of the two types of predicate is called a predicate through equivocation, and not by univocality. It gives neither a definition nor a name. Thus white is [in this equivocal sense] predicated of the white—I mean the body which is white. [392] For the white—I mean the name of the white—is separated from the white; it is not a white particular concrete thing.[14] The white is a color which arrests the vision. But the white—I mean the body of the white—is not a color which arrests the vision. For the definition of the white cannot be applied [to a body], and the name of the white does not apply to a particular concrete thing, but is split off (i.e., abstracted)[15] when white [i.e., the color] is split off (abstracted) from white things.

The categories which are predicated as accidents to the category which bears predicates, i.e., substance, are nine: quantity, quality, relation, place (lit.: where?), time (lit.: when?), action, passion, possession, and position, i.e., the situation of a thing.[16]

(II) Now as for the second of the books of logic, it is called *Peri Hermeneias* (*Bāri Ṛārmāniyās: De Interpretatione*) which means "on interpretation"; meaning the interpretation of what is said in the *Categoriae* and matters related to the existence of propositions (judgments) about an object and attribute—I mean [statements] composed of subject and predicate.

(III) As for the third of the books of logic, it is called *The First*

[14] I read *'ayn* (particular-concrete-thing) with Abū Rīdah. This word was used by the earliest Arabic translators to render Greek "substance" in the sense of *tode ti*. For this expression see the *Mafatīḥ al-'Ulum* of Muḥammad ibn Aḥmad al-Khwārizmī (p. 143 in the edition of the *Liber Mafatīh al-Olum* by G. van Vloten, Lugduni-Batavorum, 1895).

[15] The Arabic root *shaqqa*, "to break off," "to tear off" is used in rendering Aristotle's *choristos* and its cognates.

[16] Note that more space is devoted to the *Categoriae* in this outline than to the rest of the Organon combined.

Analytica (*Analuṭīqa* [al-ūlā]) which means "the conversion" of a premiss.[17]

(IV) As for the fourth of the books of logic, it is called *The Second Analytica* (*Analutīqa al-thaniyyah*) and it is also specified by the name *Apodictica* (*Afudiqtīqa*), which means "making certain."

(V) As for the fifth of the books of logic, it is called *Topica* (*Ṭubīqa*), which means "places," meaning the places of discourse.

(VI) As for the sixth of the books of logic, it is called *Sophistica* (*Sufisṭīqa*), which means "relating to the Sophists," "Sophist" means one who is arbitrary.

(VII) As for the seventh of the books of logic, it is called *Rhetorica* (*Riṭurīqa*), which means "persuasive speaking."

(VIII) As for the eighth of the books of logic, it is called *Poetica* (*Buyuṭīqa*), which means "poetry."

This constitutes the quantity of the eight logical books.

[399: IX] Thus we say: As to the subject-matter of the books of Aristotle's which we delimit, the first of them, I mean the *Categoriae*, is a discourse about the ten single expressions (categories) which we have defined (above) by giving the description of every one of them, (specifying) by what each of them is differentiated from all the others, and what each covers, and what is general to the entire number of them, and what is special to each single one of them.

[The subject-materials of this book are three.] *The first* of them is the determination of the things which are the most basic in description and explanation. These are substance-as-subject and substance-as-predicate. A substance-as-subject is a thing which does not have in it anything (else) as substance except an accident; for if an accident is [in] a subject, then an accident may be predicated of it—I mean said about it. [These points are made] to explain that a [primary] substance is sensible, and a secondary [substance] is not sensible, but is predicated [400] of the sensible; and that [primary] accidents are sensible and secondary accidents are not sensible, but are predicated of the sensible.

As to *the middle* (i.e., the second) [topic], it is explanation of the ten individuals (i.e., the categories), by describing them and [indicating] their general features and their special characteristics.

And as to *the last* (i.e., the third) [topic], it has to do with matters connected with these ten things (the categories) which exist in more than one of them; such as the "prior" [Greek: *to proteron*] and motion and "the together-with" [i.e., simultaneity, Greek: *to hama*].

[17] I render *al-'aks min al-ra's* as "the conversion of premisses." The construction of Guidi-Walzer—namely that al-Kindī is playing on the Greek word *analyein* by resolving it into the elements *ana* (Arabic: *min al-ra's*?) and *lyein* (Arabic: *'aks*)—seems to me fanciful and implausible.

Now as to the subject-matter of the second book, called *De Interpretatione* (*Peri Hermeneias*)—it deals with interpretation. It discourses about the interpretation of propositions which serve as premisses of scientific syllogisms, i.e., "unions"[18] which have "reports"[19] that are affirmative or negative; and matters connected with that.

As to the first part [of this book], it explains about how a proposition comes to be [through the combination] of a name (noun) and a verb and [it explains what] an assertoric statement is, and the "reporting" of a statement.

And as for the next [part] it has to do with propositions composed of a name and a verb, as when we say "Sa'īd is writing"; there is no contingency (accident) in that.

And as to the next [part], it deals with propositions composed of a name and a verb and a third (member), such as an increase of time when we say "Sa'īd is writing today"; there is no contingency in that.

And as to the next [part], it deals with propositions composed of a name and a verb and a third (member) and a fourth, as when we say "The sunlight is hot today and penetrating"; there is no contingency in that.

And as to the next [part], it consists in an investigation about which [types of] proposition are the strongest in natural opposition; [whether] an affirmative to its negative, or an affirmative to another affirmative contradictory to it.

Now as to the subject-matter of the third book, called *Analytica* (*Priora*), this is [devoted to] the clarification about "unions" of "premisses,"[20] [explaining] what this is, and how it is, and why it is.

A "union" of "premisses" is discourse in which various things are put forward [in such a way that] there becomes established through this another thing which was not evident in that (original) discourse, but yet is not a thing extraneous to that discourse. Now the very least [401] of which a "union" can be composed is a pair of two propositions which share one single term [in such a way that] there becomes established through them both a conclusion that was not evident in the two [premisses], but yet is not a thing extraneous to them both; i.e., is not a

[18] The word I translate as "union," namely *jami'ah*, is the Arabic equivalent of Greek *symploke*, a term introduced by Alexander of Aphrodisias to represent the relationship of three categorical statements so linked by an appropriate overlap in their terms as to be capable of constituting the two premisses and the conclusion of a syllogism. This word became infrequent in the usage of Arabic logicians after the 9th century.

[19] The word I translate as "report" namely *khabar* is seemingly an obsolete Arabic equivalent of Greek *logos apophantikos*, i.e., proposition.

[20] The word I translate as "premiss" (always in quotes) is *mursilah*, apparently an obsolete Arabic equivalent of the later *muqaddimah* = premiss, which does occur (just once) in our text (p. 400, l. 5).

thing different from what joins the terms of the two [premiss] propositions.

A "union" of "premisses" can join its two premisses by three species of joining: (i) when the shared [i.e., middle] term occurs as subject in one of the two members [premisses] and as predicate in the other, (ii) when it [i.e., the middle term] occurs as predicate in both members together, and (iii) when it occurs as subject in both members together. And there are thus three species of "union": (I) those which unite truthfully and evidentally always—these are the *apodictic* ["unions"]; (II) those which unite truthfully in a connecting "union"[21] that may be either true or false, and these are the *dialectical* ["unions"]; and (III) those which unite falsely always, and these are the *sophistical* ["unions"].

The subject-matter of the *Analytica* is one of these three species of "union," namely the [apodictic] "union" of "premisses." Its object is to discourse about these "unions" of "premisses," primarily with a view to the discovery of apodictic unions, and secondarily with ancillary matters. Thus it discourses firstly about wherein a "union" consists. Then [secondly] about how "unions" are linked together. Then [thirdly] about how many species (of "unions") there are which "make evident" [i.e., establish a conclusion], given their truth, by their very nature; and what can be established by a "motion"—I mean by a conversion or turning. Then [fourthly it discourses] about the introduction of premisses. And [fifthly] after that [it discourses] about the relationship of the second species and the third species of "union" towards the first species; on this ground this book is called the *Analytica* which means "breaking apart." Then [sixthly] it dwells [generally] upon "unions" and what is germane to them.

As to the subject-matter of the fourth book, called *Apodictica* (= *Anal. Post.*), i.e., "making certain," it discourses about conclusive "unions," I mean by those which give a demonstration—what this is, and how it is, and how it functions, and what is needful for their composition. Then [it discourses about] the first-principles of demonstration which are indispensable to a demonstration if it is to establish [a conclusion] which carries certainty for the intellect and perception.

As to the subject-matter of the fifth book, called *Topica*, it discourses about dialectical "unions" and the "places" of discourse which are necessary through a necessity external to themselves, and the fallacies that arise in this way and for these reasons. And [this book also gives]

[21] The word I render "connecting," from the Arabic root *qrn*, is a derivative from *qarīnah* = Greek *zyzygia*, a technical innovation of Alexander of Aphrodisias to represent the relationship of two categorical statements so linked by a common term as to be capable of serving together as the premisses of a syllogism.

a clarification of "the five names"—to wit: genus, and species, and difference, and proprium, and accident—and of definition.

As to the subject-matter of the sixth book, called *Sophistica*—it discourses about fallacy in the make-up of "unions" whose construction does not satisfy the syllogistic conditions[22] upon premisses that compose a "union." The first [part of this book] discourses about how fallacy comes about; and the next [i.e., the second part] discourses about safeguards against the acceptance of such fallacies in this way.

As to the subject-matter of the seventh book, called *Rhetorica*, i.e., "oratory," it discourses about the three species of persuasion, i.e., persuasion in a tribunal, [402] and in an assembly, and about praise and blame as they go together in eulogy.

As to the subject-matter of the eighth book, called *Poetica*, i.e., "poetics," it discourses about the art of poetry [treating] of words and what metric is used in every species of poem, such as the poem-of-praise (= comedy) and the poem-of-mourning (= tragedy) and the poem-of-denunciation (= satire) and others.

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[22] I read *shara'it* = conditions, with Abū Rīdah.

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IV

AL-FĀRĀBĪ ON THE QUESTION: IS EXISTENCE A PREDICATE?[1]

Since the problem of whether or not 'exists' is to be construed as a predicate has become once again the subject of active discussion in the philosophical literature,[2] it is in order to reconsider significant stages in the history of the problem. The question at issue is frequently taken as arising from Kant's denial that existence is a predicate, a denial put forward in the interests of a refutation of the Ontological Argument for the existence of God. It may therefore be of interest to draw attention to a discussion of this question by the Arabic philosopher al-Farabī, which precedes the *Critique of Pure Reason* by well-nigh a millennium, and antedates St. Anselm himself by fully a century.

Abū Nasr al-Fārabī was born in Farab, in Turkestan, not long after 870, and died in the environs of Damascus in 950, concluding a distinguished career as influential teacher and respected scholar. Author of well over seventy philosophical treatises, al-Farabī devoted a large portion of his efforts to logic, writing extensive commentaries on Aristotle's logical work, and composing numerous shorter treatises devoted to special problems.[3] Of immediate interest here is a short collection entitled "Treatise on answers to questions asked of him" (*Risālah fī jawāb masā'il su'ila 'an-hā*), which contains brief answers to some forty miscellaneous questions, partly relating to logic.

Our present concern is with the sixteenth question, which I translate from the Arabic text edited by Friederich Dieterici:[4]

[1] Work on this chapter was carried on with the support of the Institute of Research of Lehigh University, which is gratefully acknowledged.

[2] See, for example, R. Harré, "A Note on Existence Propositions," *Philosophical Review*, vol. 65 (1956), pp. 548–549; G. Nakhnikian and W. C. Salmon, " 'Exists' as a Predicate," *ibid.*, vol. 66 (1957), pp. 535–542; H. S. Leonard, "The Logic of Existence," *Philosophical Studies*, vol. 7 (1956), pp. 49–64; N. Rescher, "On the Logic of Existence and Denotation," *Philosophical Review*, vol. 68 (1959), pp. 157–180. A useful synthesis of earlier discussions is W. Kneale, "Is Existence a Predicate?" *Aristotelian Society Supplementary Volume* no. 15 (1936), reprinted in *Readings in Philosophical Analysis* ed. by H. Feigl and W. Sellars (N.Y., 1949), pp. 29–43.

[3] For a comprehensive listing of materials relating to al-Fārabī see Nicholas Rescher, *Al-Fārabī: An Annotated Bibliography* (Pittsburgh, 1962). The fullest account of al-Farabī's work is still that of Moritz Steinschneider, "Al-Farabi," *Mémoires de l'Académie Impériale des Sciences de Saint-Petersbourg*, série 7, vol. 13 (1869).

[4] *Alfarabi's Philosophische Abhandlungen* (Leiden, 1890), p. 90. A German translation of the eight treatises of al-Farabī published in this work was issued by Dieterici under the same title and imprint in 1892 (see pp. 148–149 for our passage).

Question: Does the proposition "Man exists" have a predicate, or not?

Answer: This is a problem on which both the ancients and the moderns disagree; some say that this sentence has no predicate, and some say that it has a predicate.[5] To my mind, both of these judgments are in a way correct, each in its own way. This is so because when a *natural scientist* who investigates perishable things considers this sentence (and similar ones) it has no predicate, for the existence of a thing is nothing other than the thing itself, and [for the scientist] a predicate must furnish information about what exists and what is excluded from being.[6] Regarded from this point of view, this proposition does not have a predicate. But when a *logician* investigates this proposition, he will treat it as composed of two expressions, each forming part of it, and it [i.e., the composite proposition] is liable to truth and falsehood.[7] And so it does have a predicate from this point of view. Therefore the assertions are both together correct, but each of them only in a certain way.

Consideration of the question "Is 'exists' a predicate?" and of the logical issues involved in it thus goes back at least to around A.D. 900. Further, al-Fārābī's insistence that the attribution of existence to an object adds nothing to its characterization, and provides no new information about it, effectively anticipates Kant's thesis that: "Sein ist offenbar kein reales Prädicat, d. i. ein Begriff von irgend etwas, was zum Begriffe eines Dinges hinzukommen könne."[8]

A word must be said as to the problems which occasioned al-Fārābī's treatment of the matter. Al-Fārābī, followed in this regard by Ibn Sīnā (Avicenna), wants clearly to distinguish the existence (*huwiyyah*) of a thing from its essence (*mahiyyah*).[9] But if "exists" is a predicate, then the

[5] By 'ancients,' the Islamic philosophers intend the Greek thinkers and their Hellenistic expositors, by 'moderns' the philosophers who used Arabic. Compare Averroes: "The ancient philosophers considered the First Principle . . . as a simple existent. As to the later philosophers in Islam, they . . . [also] accept a simple existent of this description." *Tahafut al-Tahafut*, translated by S. Van den Bergh (Oxford, 1954), vol. I, p. 237.

[6] That is to say, the predicate must give information regarding the nature (*mahiyyah* 'what'-ness, *quidditas*) of the thing in question. The existence of a thing (its *huwiyyah*, 'that'-ness, *esse*) is not a part of its essence.

[7] Grammatically, 'Man exists' is a complete sentence, with a grammatical subject, 'man,' and a grammatical predicate, 'exists.' Thus due to close parallelism between the logical and the grammatical relations (especially in Arabic) al-Farabī unhesitatingly classes 'exists' as a legitimate grammatical (or logical) predicate. Even Kant agrees with this, affirming that: "zum logischen Prädicate kann alles dienen, was man will."

[8] Compare also Averroes' view that "the word 'exists' does not indicate an entity added to its [i.e., a thing's] essence outside the soul, which is the case, when we say of a thing that it is white." *Tahafut al-Tahafut*, vol. II, p. 118.

[9] On their view, these coincide only in God.

existence of a thing would seem to become one of its properties, and could thus be held to be among the attributes constituting its essence. To preserve a clear distinction between essence and existence, al-Fārābī denies that existence is a predicate (i.e., an *informative* predicate).[10]

The historical origin of the distinction between essence and existence has not yet wholly emerged from obscurity. In her masterly study of *La Distinction de l'Essence et de l'Existence d'après Ibn Sīnā* (Paris, 1937), Mlle. A. M. Goichon puts the matter as follows:

> Ibn Sīnā la recevait [i.e., la distinction de l'essence et de l'existence] de Farabī qui l'avait entrevue, mais sans lui donner tout son ampleur. Très probablement, tous deux l'ont considerée comme déduite des principes aristotéliciens, car ils n'en parlent jamais comme d'une découverte. Elle fait presque figure de lieu commun, et nulle référence ne permet d'affirmer quel texte la leur a inspirée. Peut-être les recherches dans les manuscrits, les traductions, les gloses anciennes, permettront-elles de déterminer la source. Pour le moment les matériaux nous manquent . . . et nous ne pouvons remontrer avec certitude plus loin que Farabī. (Pp. 131–132.)

There is no doubt, however, that the distinction was inspired by Aristotle, and took definite form in the hands of his commentators and expositors. There is nothing in the Arabian distinction between *mahiyyah* and *huwiyyah* that could not arise naturally out of explicative glosses on the following passage of the *Posterior Analytics*:

> He who knows what human—or any other—nature is, must know also that man exists; for no one knows the nature of what does not exist. . . . But further, if definition can prove what is the essential nature of a thing, can it also prove that it exists? And how will it prove them both by the same process, since . . . what human nature is and the fact that man exists are not the same thing? Then too we hold that it is by demonstration that the being of everything must be proved—unless indeed to be were of its essence; and since being is not a genus,[11] it is not the essence of anything. Hence the being of

[10] Avicenna, however, held that existence is a predicate, and therefore, save with God, necessarily an accident (so that it would not be an essential property). Averroes, who denied the validity of the distinction between essence and existence, and argued against Avicenna on this ground, also condemned Avicenna's "mistake that the existence of a thing is one of its attributes." *Tahafut al-Tahafut*, vol. I, p. 236; see also vol. II, footnote 237.4.

[11] Cf. *Metaph.* 998b14–24, 1045a34–68. Nor, on Aristotle's view, is being an attribute of things (*An. Post.*, 90a2–4). This, in effect, amounts to al-Farabī's point that existence is not an *informative* predicate. Aristotle does, however, insist that being is a *predicate* (*Metaph.* 1053b17–21), but his view and its grounds find accommodation in al-Fārābī's assertion that existence is a logical predicate.

> anything as fact is matter for demonstration; and this is the actual procedure of the sciences, for the geometer assumes the meaning of the word triangle, but that it is possessed of some attribute he proves. What is it, then, that we shall prove in defining essential nature? Triangle? In that case a man will know by definition what a thing's nature is without knowing whether it exists. But that is impossible. (*An. Post.*, 92b3–18 (Oxford translation); cf. also 93a ff.)

For Arabic philosophy then, the question "Is 'exists' a predicate?" arises, *not* from considerations relating to the Ontological Argument, but out of a desire to sharpen and clarify the Aristotelian distinction between the essence of things on the one hand, and their being or existence upon the other. Not the problem of proving God's existence, but the increasing systematization of certain concepts of Aristotle's logic occasioned al-Farābī to take up the problem of existence as a predicate.

V

AN INTERPRETATION OF ARISTOTLE'S DOCTRINE OF FUTURE CONTINGENCY AND EXCLUDED MIDDLE

It is often said that in Chapter 9 of *De Interpretatione* (henceforward abbreviated DI9) Aristotle rejects the applicability to propositions about future contingent matters of either the "Principle of Bivalence," which holds that propositions must be either true or false,

$$(1a)\quad N[T(p) \vee F(p)]$$

or its cognate, the "Law of Excluded Middle," which holds that of a proposition and its contradictory one must be true,

$$(1b)\quad N[T(p) \vee T(\sim p)].$$

(Here p is a propositional variable, $\sim p$ is the contradictory of p, v stands for disjunction, and T(p), F(p) and N(p) abbreviate "p is true" "p is false," and "necessarily p (is true)," respectively. The symbol $\rightarrow$ to be used below represents entailment.) Thus for example, Martha Hurst Kneale avers that "In chapter 9 of the *De Interpretatione* Aristotle questions the assumption that every declarative sentence is true or false."[1] Richard Taylor states that "Aristotle, as I understand him, maintains that all propositions are either true or false, with the sole exception of a limited class of propositions about the future, viz., those that assert the occurrence, or non-occurrence, of some future contingency."[2] Charles A. Baylis writes that "doubts about the principle that every proposition is either true or false were entertained even by Aristotle."[3] Leonard Linsky discusses, *inter alia*, "Aristotle's reason for abandoning the law of excluded middle as regards propositions about the future."[4] A. N. Prior speaks of "the third or 'neuter' truth-value of Aristotle and Lukasiewicz."[5] According to a widely held view, then, Aristotle places propositions regarding future contingents into a truth-status limbo.

I am perfectly prepared to grant that a case can be made out for holding that what Aristotle says in DI9 can be construed in this way, and I am fully aware that many major Aristotelians, even in antiquity,

[1] *Kneale* (1962), pp. 46–47. For references of this form see the Bibliography at the end of this chapter.

[2] *Taylor* (1957), p. 2. [3] *Baylis* (1936), p. 156.

[4] Linsky's response to *Williams* (1951), p. 250. [5] *Prior* (1957), p. 86.

have so understood him. We may instance such eminent ancient authorities as Ammonius[6] and Boethius.[7] And this interpretation is even older. The Stoics thought they were opposing Aristotle in teaching that all propositions, even those regarding future contingent matters, are either true or false; and the Epicureans thought they were supporting him in attacking this position.[8]

I wish nevertheless to argue here: (i) that the logic of the situation is such that DI9 can be regarded as making a point quite different from the rejection of (1), (ii) that this alternative interpretation represents a textually possible construction of Aristotle's discussion, and (iii) that such an alternative reading of this chapter accords more smoothly with the general structure of Aristotle's logical position.

Most interpreters of DI9 are agreed, and we fully concur, that in DI9 Aristotle opens the discussion (18a28–34) with an insistence that only a *limited* acceptance can be accorded to the theses that *propositions must, if true (or false) be true (or false) necessarily,*

$$\begin{cases} (2a) & T(p) \rightarrow N(p) \text{ or perhaps } T(p) \rightarrow N[T(p)] \\ (2b) & F(p) \rightarrow N(\sim p) \text{ or perhaps } F(p) \rightarrow N[F(p)] \end{cases}$$[9]

and that *every proposition is either on the one hand necessarily true, or upon the other, necessarily false,*

$$\begin{cases} (3a) & N[T(p)] \vee N[F(p)] \\ (3b) & N(p) \vee N(\sim p) \\ (3c) & N[T(p)] \vee N[T(\sim p)] \end{cases}$$[10]

although the *exact* formulation of the principle at issue is capable of somewhat diverse constructions (as indicated), it is plain from his text that Aristotle insists that the applicability of each of these two principles is confined to omnitemporal propositions and to propositions regarding specific occurrences in the present and-or past: future contingents being explicitly and deliberately ruled out of the region of their applicability. Again, it is transparently clear from the ensuing discussion (18a34–19a18) that Aristotle's reason for restricting the range of these principles by excluding their applicability to future contingents is a desire to avoid the fatalistic consequence, as he sees it, that if every true proposition is necessarily true (and every falsehood necessarily false) then there are no non-necessary truths (or falsehoods) whatsoever, and *a fortiori* no contingent truths (or falsehoods).

[6] See *Ammonius* (fl. 490). [7] See *Boethius* (fl. 510). Cf. *Kneale* (1962), p. 190.

[8] See *Mates* (1953), pp. 28–29.

[9] Several possibilities are listed because an exact discrimination on basis of the text is virtually impossible. On the ideas involved in these theses see *Anscombe* (1956) and *Prior* (1955), pp. 247–248.

[10] It was against the limitation of (3) that part of the Stoic attack on DI9 was directed. See *Kneale* (1962), pp. 133–134.

Our problem can now be put into clear focus. On the one hand, Aristotle is committed to an unqualified acceptance of,

$$(4) \quad T(p \vee \sim p) \text{ or indeed } N[T(p \vee \sim p)]$$

On the other hand, in DI9 he is clearly committed rejecting the unqualified applicability of (3). But now what of,

$$\begin{cases} (1a) & N[T(p) \vee F(p)] \\ (1b) & N[T(p) \vee T(\sim p)] \end{cases}$$

Is (1), like (4), unqualifiedly correct; or is it, like (3), correct only if one *excludes* future contingents from its domain of application? In short, does Aristotle in DI9 reject the universal applicability of the Principle of Excluded Middle (and-or Bivalence) by holding that propositions regarding future contingents are to be placed into a truth-status limbo?

One common and historic reading of DI9 is, as we have seen, to construe it as presenting an affirmative answer to this question. However, the interpretation I wish to defend here is that Aristotle is prepared to uphold (1) unqualifiedly—just like (4). It is proposed to read DI9 *as arguing merely that* (3) *but not* (1) *is to be qualified by temporal limitations*. This reading of DI9 was, so far as I know, first adopted by the eminent Arabic philosopher al-Fārābī.[11] In the West, this interpretation was first made by Abelard, whose interpretation of this text has been sketched by a modern historian as follows:

> No proposition *de contingenti futuro* can be either determinately true or determinately false in the same sense, but this is not to say that no such proposition can be true or false. On the contrary, any such proposition is true if the outcome is to be true as it states, even though this is unknown to us (*'si futurum sit ut propositio dicit, etsi ignoratum nobis sit'*). What Aristotle wished to maintain in his *De Interpretatione* was that, while a proposition is necessarily true when it is true, it is not therefore necessarily true simply and always.[12]

This interpretation of DI9 we shall characterize as Farabian. It was adopted, so far as I can see, by Averroes,[13] by St. Thomas Aquinas, [14] and also, apparently, by Duns Scotus,[15] and by Ockham.[16] One can readily understand the appeal of this interpretation to Christian and Muslim Aristotelians who had to reconcile the Master with the theo-

[11] See *Farabī* (fl. 910). I hope to publish a translation of this text on another occasion.
[12] *Kneale* (1962), p. 214. [13] See *Averroes* (fl. 1165).
[14] For the position of St. Thomas see *Aquinas* (fl. 1265), and also *Ockham* (fl. 1325), pp. 431–432, where Boehner's strictures arise from the misunderstanding inherent in his words "determinatedly true, as I believe," at the bottom of page 431.
[15] I so judge on the basis of Boehner's statement in *Ockham* (fl. 1325), p. 432. I have not checked the text.
[16] See *Ockham* (fl. 1325), p. 434, the footnote.

logical teachings of their faith. (How could there be divine foreknowledge if future-contingent statements are neither true nor false?) Modern neo-scholastic Aristotelians generally adopt the medieval view. Thus Jacques Maritain holds that a future contingent proposition "is *true* or *false*" but "is neither actually and determinately true nor actually and determinately false."[17]

In modern times, this interpretation of DI9 was endorsed by E. M. Edgehill, the Oxford translator of *De Interpretatione*, who epitomizes the doctrine of DI9 in his analytical *Table of Contents* as follows: "Propositions which refer to present or past time must be either true or false: propositions which refer to future time must be either true or false, but it is not determined which must be true and which false."[18] Another modern adherent of the Farabian interpretation is Ronald J. Butler who writes in a recent paper: "On my reading, Aristotle would hold that the principle of excluded middle, formulated semantically, is logically necessary in all cases, no matter whether the subordinate propositions to which it is applied be in the future tense, the present, or in the past. . . . Aristotle wished to segregate the class of contingent propositions in the future tense because they are *neutral* not in the sense of being intermediate between truth and falsehood, but in the sense of not being already predetermined."[19] This reading of DI9 has also been adopted by G. E. M. Anscombe,[20] and Colin Strang,[21] who alone of all recent exponents of this view of whom I know have fortified this position by a detailed analysis of the text.[22]

It is clear, first of all, that there is nothing in the general framework of his position that forces Aristotle to yield up the applicability of (1) to future contingents. He must (and of course does) reject (3) as unqualifiedly applicable; that is granted by everyone. But (1) would not lead to (3) except through an unqualified (2). And of course Aristotle cannot, and indeed does not accept (2) generally, without a qualification to exclude future contingents from its domain. Thus the logic of his position leaves Aristotle free to accept (1) without any restrictive qualifications.

But does he do so? Can the text of DI9 be construed to square with al-Fārābī's "non-standard" interpretation? To answer this question

[17] *Maritain* (1937), p. 97. One must suppose that "actually and determinately" is here to be taken as a circumlocution for "necessarily."

[18] It must be said, however, that this view is out of accord with Edghill's interpretation of the text as embodied in his translation. (For an example, see footnote 24 below.) I find this discrepancy incomprehensible.

[19] *Butler* (1955), pp. 269–270. [20] See *Anscombe* (1956), see especially p. 4.

[21] See *Strang* (1960), especially pp. 460–465.

[22] Miss Anscombe's position finds endorsement in *Albritton* (1957) and in *Hintikka* (1959).

I shall preface any consideration of specific passages by an outline of the dialectic of DI9 as I am proposing that it should be understood by an adherent of Farabian interpretation.

Conception of the Architectonic of DI9

Passage	*Construction*
18a28–18a33	Qualified acceptance (and qualified rejection) of: (2a) $T(p) \rightarrow N[T(p)]$ (2b) $F(p) \rightarrow N[F(p)]$ (3a) $N[T(p)] \vee N[F(p)]$ (3b) $N(p) \vee N(\sim p)$ (3c) $N[T(p)] \vee N[T(\sim p)]$ The acceptability of these principles is confined to omnitemporal and past-cum-present propositions.
18a33–18a34	Summary rejection of the applicability of (2) and (3) to singular propositions about future occurrences (i.e., to future contingents).
18a34–18b6	Setting-up the case of unqualified acceptance of (2) and (3) as an hypothesis, preliminary to its destruction by inferring unacceptable consequences.
18b7–18b25	Eliciting the unacceptable consequences of the foregoing hypothesis.
18b25–19a18	Discussion of why and how these consequences are to be regarded as unacceptable.
19a18–19b4	Establishment of the thesis that (2) and (3) must be qualified by excluding their applicability to future-contingents.

This tabulation shows the general structure of our proposed reading of DI9. It strongly (and I think rightly) suggests that the rejection of (1) is simply *not at issue* here.

Before turning to a consideration of Aristotle's text I want to emphasize my view that in the interpretation of DI9 the greatest probative weight must be given to its concluding section (i.e., from 19a18–19b4) which is *the only* section of this chapter where Aristotle is directly engaged in formulating *in propria persona* his own view on the controversial matters at issue. I shall now support the Farabian construction of DI9 by a detailed interpretation of this pivotal passage.

* * *

Translation and Interpretation of De Interp. 19a18–19b4

It is thus apparent that not everything is or comes to be by necessity, but that some things come about by chance. (The tone of the entire ensuing discussion is set by this introductory insistence that not everything is *necessary*.) *And here [i.e. when things come about by chance] the affirmation is not true rather than the negation [by necessity]: even when one [particular] alternative may be realized for the most part, it may still be that the other [rarer] alternative may chance to come about instead of [the usual] alternative.* (I take the *ex anagkes* ("by necessity") of the preceding sentence to be still operative here, so that what is at issue in the first sentence here is not truth, but *necessary* truth. What is thus denied in the case of future contingents subject to chance is not that "T(p) v T(∼p)" but "N(p) v N(∼p)." This construction seems not only possible but indeed plausible, in view of the basic underlying contrast here between *chance* on the one hand and *necessity* on the other. The explicit opposition of that which happens always to that which happens sometimes or even for the most part, supports the view that necessity, rather than mere truth is at issue here.)

That which is will be necessary when once it is, that which is not [will be necessary] when it is not. (That is, we have "T(p)→N(p)" and "T(∼p)→N(∼p)" for propositions regarding the past-cum-present.) *But not everything that is is necessary, nor is all that is not necessarily not. For it is not at all the same that "Everything is so by necessity when once it is" and that "Everything is so by necessity."* (It is one thing to maintain "T(p)→N(p)" for propositions regarding the past-cum-present, and another to maintain it unqualifiedly.) *And similarly also with that which is not.* (That is, one can only maintain "T(∼p)→N(∼p)" with the same restriction.) *And the same account holds for contradictories.* (That is, the applicability of "N(p) v N(∼p)" must also not be made universal, but confined to propositions regarding the past-cum-present.) *For it is necessary that everything either be or not be; and [it is likewise necessary that everything] either will come to be or not.* (That is, the applicability of "N(p v ∼p)" can be maintained without any temporal restriction.) *But we cannot say specifically that one or the other alternative is necessary.* (We cannot maintain "N(p) v N(∼p)" unqualifiedly.)

For example, it is necessary that there will either be a sea-battle tomorrow or that there will not be one. (That is, if p_1 is the specific proposition asserting that a sea-battle will take place tomorrow, then we have "N(p_1 v ∼p_1).") *But it is neither necessary that there will be a sea-battle tomorrow, nor [is it necessary] that there will not be one.* (We do not have "N(p_1) v N(∼p_1).") *That it will take place or will not take place is necessary.* (So we only have "N(p_1 v ∼p_1).") *Since it is with the truth of statements as with the facts they state,* (that is, while neither "a sea-battle is occurring" or

"a sea-battle is not occurring" must necessarily represent a true state of affairs, "a sea-battle is either occurring or not" must necessarily represent a true state of affairs,) *it is evident that whenever there is a contingent matter that may chance to turn out in either of opposite ways, the contradictory alternatives must be of the same status* [*sc. as regards necessity, NOT as regards truth*]. (As I read this, Aristotle is not saying that, for a future-contingent *p* we are to regard "T(p)" and "T(~p)" as being of the same status, but rather that "N(p)" and "N(~p)" are of the same (truth) status—both being false.) *This is* [*generally*] *the situation with whatever is not at all times the case or at all times not the case* [*i.e., with the contingent*]. (That is, we always here have "N(p v ~p)" but never "N(p) v N(~p).") *For here it is necessary that one or the other member of the contradictory alternative be true or false;* (Here we have "N([T(p) & F(~p)] v [T(~p) & F(p)]).") *but it is neither necessary that this one rather than that one* [*be true or false*]*—but only whichever chances to come about.* (That is, although we have "N([T(p) & F(~p)] v [T(~p) & F(p)]," we do not have "N[T(p) & F(~p)] v N[T(~p) & F(p)]." I regard this sentence as very powerful evidence for the view that Aristotle is not here rejecting the applicability of "N[T(p) v F(p)]" and|or "N[T(p) v T(~p)]" to future contingents.) *Even if one* [*alternative*] *seems true* [*or false*] *rather than the other, that does not mean it is* [*necessarily*] *true or false.* (Again we must regard the *necessity* of the entire context to be operative at this point.)

It is thus plainly not the case with all contradictorily opposed affirmations and denials that it is necessary that one be true and the other false. (I take this to affirm the need for limiting the applicability NOT of "N[T(p) v F(p)]" but of "N[T(p)] v N[F(p)]" or else "N(p) v N(~p).") *For the situation is quite different with those things that actually are, and with those things that are not actual but have a potentiality to be or not to be; as we have stated above.* (The back-reference must be understood to apply to 18a28–34, the point being that the case of future contingents differs from that of matters past-or-present as regards (on our view) *necessity*, not as regards having a truth-status.)

* * *

The interpretation of DI9 is throughout bedeviled by the difficulty of formulating the exact logic of modal theses in ordinary language. In Aristotle's Greek—just as in ordinary English—there tends to be a systematic ambiguity between, on the one hand,

(1a) N[T(p) v F(p)]
(1b) N[T(p) v T(~p)]

and on the other,

$$\begin{cases} (3a) & N[T(p)] \vee N[F(p)] \\ (3b) & N(p) \vee N(\sim p) \\ (3c) & N[T(p)] \vee N[T(\sim p)] \end{cases}$$

One of the factors that makes it unacceptable to use the standard translations in evidence against the view we are adopting is that most translations—specifically including even the Oxford translation[23]—tend to resolve this ambiguity of Aristotle's Greek in favor of the orthodox position that DI9 argues against the applicability to future-contingents of (1), rather than of (3).[24] However, once this systematic ambiguity is admitted, a great part of the difficulty in the way of the Farabian interpretation of DI9 is removed.[25]

Even apart from this particular "systematic ambiguity," there are a number of passages in DI9 from which it would appear that Aristotle is urging the limited acceptability of (1) rather than of (3). (Several of these have already been dealt with in our analysis of the text considered above.) A typical instance of this residual difficulty is the following passage:

> (18b6–9) *Thus* [*consider the incorrect position that*] *nothing ever is or comes to be by chance . . . but everything is by necessity, and not subject to chance: either he who affirms* [*a future contingency*] *speaks the truth or he who denies it.* (It would seem that in the final sentence Aristotle is saying that neither the affirmation nor the denial *is true.* But the "by necessity" of the introductory clause should be taken as still operative at this point: neither is true *by necessity.* Contrast the same point made above in respect of 19a18–22.)

This case is typical of the difficulties that remain for our interpretation once the cases of "systematic ambiguity" are disposed of: *The context is invariably such that what appears* prima facie *as an argument against the truth (or falsity) of future contingents can equally well—or better—be construed as directed against their NECESSARY truth (or NECESSARY falsity).*

Interpreters are generally inclined towards the view that Aristotle seems committed in the bulk of his logical discussions to upholding the

[23] See footnotes 18 *supra* and 24 *infra.*

[24] For example, the Oxford translation of 19b1–2 reads with seeming decisiveness: "It is therefore plain that it is not necessary that of an affirmation and a denial one should be true and the other false." Here the Arabic translation (of the eminent scholar Ishaq ibn Hunain) used by al-Farabi reads: "It is clear by this that not every [contradictory] affirmation and denial is such that one of the two is true by necessity and the other false by necessity." (*Farabī* (fl. 910), p. 97, lines 1–3).

[25] For a careful analysis of the ways in which this ambiguity is at work in Aristotle's text see *Strang* (1960). It should perhaps have been mentioned prior to this point that I have followed the Greek text of H. P. Cooke in the Loeb Classical Library.

universal applicability of the Law of the Excluded Middle with respect to determinate propositions and to genuine contradictories. Many students of Aristotle's logic are prepared to grant that, apart from DI9, Aristotle seems to take the position that the theses

$$\begin{cases} (1a) & N[T(p) \vee F(p)] \\ (1b) & N[T(p) \vee T(\sim p)] \end{cases}$$

obtain without qualification. For anyone who holds this view it would seem—on solely methodological grounds—that so long as the Farabian interpretation of DI9 is textually feasible it ought to be adopted. For it is surely a sound principle that, whenever alternative constructions of a given text are possible only one of which accords with the authors general position, this doctrinally compatible alternative is to be preferred.

The placing of future-contingent statements into a truth-status limbo is patently a philosophically most interesting position. If the Farabian reading of DI9 is correct, this interesting theory was born by a misunderstanding of Aristotle's text. Such a humble historical origin—shared by so many other philosophically exciting doctrines—would of course in no way militate against the conceptual significance or viability of the position at issue.

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VI

A TENTH-CENTURY ARAB-CHRISTIAN APOLOGIA FOR LOGIC

I. *Introduction*

The existence of widespread distrust towards Greek science, philosophy, and logic within the three major religious communities upon which Greek learning made its impact in the 6th–12th centuries—the Christians,[1] Muslims,[2] and Jews[3]—is a well-known phenomenon. An entire genre of literature—the *défense raisonnée* of the religious acceptability of philosophical studies—is known to have developed on account of this antagonism. My present concern is with a portion of an almost unexplored sector of this tradition—the *apologia* for logic.

Within the Christian orbit, St. John of Damascus wrote in defense of logical studies,[4] and his views worked powerfully for the acceptance of this discipline among the Syriac-speaking Christians. Already al-Farabī (b.*c.* 870) had written a defense of logic based on sayings of the Prophet,[5] but the position of al-Ghazzalī was decisive for the acceptance of logic in Islam. Opposed to Greek philosophy in general, and especially to its use as a basis for Islamic theology, he was willing not only to tolerate logic, but to support and recommend its study as an essential instrument of the clear reasoning needed as guide in the good life.[6]

[1] E. Gilson has graphically described the unremitting opposition with which, since the days of Tertullian, some Christian circles combatted philosophical speculation in general, and dialectical techniques in particular. *Reason and Revelation in the Middle Ages* (N.Y., 1938), pp. 5–15 (especially pages 6 and 11).

[2] See the classic study of Ignaz Goldziher, "Stellung der Alten Islamischen Orthodoxie zu den Antiken Wissenschaften," *Abhandlungen der Preussische Akademie der Wissenschaften* (Philosophisch-historische Klasse) Berlin, 1916 (Jahrgang, 1915). Already al-Kindı, the first notable Muslim philosopher, included in his treatise on metaphysics a chapter "That religion does not conflict with philosophy" (*fī anna-'l-dīn la yata'arid ma'-'l-falsafah*). See pp. 82–83 of A.F. al-Ahwanī (ed.), *Kitab al-Kindī fī-'l-falsafah al-ula* (*Cairo*, 1948).

[3] Cf. Leo Strauss, *Persecution and the Art of Writing* (Glencoe, Ill., 1956) p. 20. Note also his comment that, "As late as 1765 Moses Mendelssohn felt it necessary to apologize for recommending the study of logic, and to show why the prohibition against the reading of extraneous or profane books does not apply to works on logic" (*ibid.*).

[4] R. Walzer, "New Light on the Arabic Translations of Aristotle." *Oriens*, vol. 6 (1953), pp. 91–142 (see p. 99); reprinted in *Greek into Arabic* (London, 1962), pp. 60–113 (see p. 68).

[5] Goldziher, *op. cit.*, p. 24.

[6] G. von Grünebaum, *Islam* (London, 1961, second edition), p. 119; cf. p. 116.

In the Jewish orbit, Moses Maimonides wrote a handbook of logic, and a defense of its study which militated importantly towards its (limited) acceptance in medieval Judaism. These three positions are of course not independent but connected: Syrian Christianity fashioned the Muslim conception of Greek logic, and the Maimonides' views on logic were essentially an integral part of the Arabic tradition. It is noteworthy however that despite the deep-rooted and widespread opposition to theoretical philosophy in each of the three major religious traditions, the very leading intellects in each case came forthrightly to the defense of logic. And indeed, logic generally prevailed over objections to make its way into the very citadel of its opponents, the theological curriculum, where it was still to be found in Syrian Christianity in the time of Bar Hebraeus, and where in Islam its arrival in the *madrasahs* in the thirteenth century is attested to by the rapid development of an instructional literature (handbooks with appropriate commentaries and glosses).

The treatise which will concern us here—a defense of the religious propriety of the study of philosophy in general and logic in particular written in Arabic by the 10th century Nestorian Christian 'Īsā ibn Ishāq ibn Zur'ah of Baghdad—is a most interesting example of an *apologia* for logic within the indicated domain. This treatise is so far as I know extant in the Arabic original in only one manuscript (Paris, MS arabe 132 [J. 1629], 166 *verso*–170 *recto*).[7] The English version of this work which we have given below (made from a photocopy of this Parisian text) is its first translation into a European tongue. A transcription of the Paris text will be published elsewhere.*

Ibn Zur'ah was born in Baghdad in 942. He was trained as a physician, theologian, and philosopher. His most important teacher was his correligionist, the important theologian-scholar Yaḥyā ibn 'Adī (893–974).[8] Ibn Zur'ah made Arabic translations of several Greek scientific and philosophical works—including Aristotle's *Sophistici Elenchi*. (His translations were, however, made exclusively from Syriac versions; it is virtually certain that he knew no Greek.) He trained several scholars of importance in the subsequent generation, of whom the most important was Ibn al-Ṭayyib (*c.* 980–1043).[9] After a long and

[7] Parts of this text are also given in a series of extracts by Ẓahīr al-Dīn al-Baihaqī from passages in defense of the art of logic by Ibn Zur'ah extant in Berlin, Arabic MS 10052, 39 *verso*–42 *verso*. I have been unable to consult this MS.

* N. Rescher, "A Tenth-Century Arab-Christian Apologia for Logic," *Islamic Studies* (Journal of the Central Institute of Islamic Research, Karachi), vol. 2 (1963).

[8] See A. Perier, *Yahya ben 'Adī: Un Philosophe Arabe Chrétien du Xe Siècle* (Paris, 1920); Brockelmann, GAL, I, p. 207.

[9] See S. M. Stern. "Ibn al-Ṭayyib's Commentary on the *Isagoge*," *Bulletin of the School of Oriental and African Studies, University of London*, vol. 19 (1957), pp. 419–425.

fruitful career as scholar and teacher, Ibn Zur'ah died in his native city in 1008.[10]

Ibn Zur'ah's defense of logic is of interest in part because of its very existence and in part, of course, due to its contents. Its existence is of interest because it shows the felt need for a propaganda on behalf of the study of logic within the Christian community of Syria-Iraq at a time when training in logic was not only the standard part of the preparation of its doctors, scholars, and theologians, but when this community actually led the world in logical scholarship.[11]

One of the interesting aspects of Ibn Zur'ah's treatise is the occasional use in this Christian polemic of technical terms of Muslim theology, most notably, *shari'* for "religious-teaching." Another striking feature is its emphasis upon prophets and their certification as genuine prophets through the performance of miracles. The emphasis on this point doubtless stems largely from the need of Christian groups within the Muslim orbit for anti-Islamic polemic and propaganda to assure continuing faithfulness.

From a substantive standpoint, Ibn Zur'ah's treatise is primarily interesting because of the key idea of its defense of logic. This runs as follows: Only through the application of logic in philosophical reasoning do we learn what is possible and what is impossible in the nature of things. But the evidence for the Christian religion rests on the occurrence of miracles.[12] And a miracle is the occurrence of something that is

[10] Information regarding Ibn Zur'ah's life and writings can be found in C. Brockelmann's classic *Geschichte der Arabischen Litteratur* (vol. I, p. 208, and Supplementary volume I, p. 371); and in two works by Georg Graf, *Die Christlich-Arabische Literatur* (Freiburg im Breisgau, 1905, pp. 52–55), and *Geschichte der Christlichen Arabischen Literatur*, (Vatican City, 1947) *Studie e Testi*, no. 133, see II, pp. 252–256. I have not seen the Sorbonne dissertation (these) of C. Haddad, *'Isā b. Ẓur'a, philosophe arabe et apologiste chretien du Xe siècle*, Paris, 1952, typescript of 366 pp. (cited by R. Walzer in *Greek into Arabic* (London, 1962), p. 112).

[11] Abu-'l-Khair ibn Suwar, commonly known as Ibn al-Khammar (942–1020), an important Nestorian scholar (Brockelmann, GAL, SI, 378; S. M. Stern, J.R.A.S., 1956, pp. 31–33), and doubtless an acquaintance of Ibn Zur'ah's, since—like Ibn Zur'ah himself—he was a pupil of the famous scholar Yaḥya ibn 'Adī—is also known to have written a treatise "On the Accord Between the Teachings of the Philosophers and Christianity."

[12] The emphasis in the Syrian-Christian tradition on the evidential primacy of miracles appears to derive from St. John of Damascus. It is explicit in the Arabic writings of his pupil Theodore Abu Kurrah. See G. Klinge, "Die Bedeutung der syrischen Theologen als Vermittler der griechischen Philosophie an den Islam," *Zeitschrift für Kirchengeschichte*, vol. 58 (1939), pp. 346–386 (see pp. 376–377). Ibn al-Ṭayyib, Ibn Zur'ah's correligionist and pupil, wrote: "Aussi Notre Seigneur le Christ a-t-il operé des miracles pour le vulgarie, tandis qu'il usait de preuves et de démonstrations logique à l'intention des excellents philosophes, qui ne se laissent pas guider par les miracles, ni n'en tirent un enseignement profitable." (Cited by S. Pines, "La 'Philosophie Orientale' d'Avicenne et sa Polémique Contre les Baghdadiens,"

naturally impossible. But if the possible and impossible can be discriminated from one another only by a recourse to logic and philosophy, then these disciplines are absolutely essential to sound theology. Thus, rather than undermining religion, logic and philosophy are an indispensable part to its foundation.

One feature of Ibn Zur'ah's argument must seem strange to modern readers. After undertaking to establish that logic is needed as a means of discriminating between the possible and the impossible, Ibn Zur'ah takes his key example from *medicine*. Two considerations seem to account for this. In the first place, the tradition into which Ibn Zur'ah falls views logic as the necessary instrument of reasoning of all the sciences—so that if medicine (e.g.) is needed to make a certain discrimination logic is required for it *a fortiori*. Secondly, there is a particularly intimate link between logic and medicine in the entire "logico-medical" tradition from Galen to Avicenna, and logical and medical studies were regarded as virtually inseparable.

Upon the whole, I believe that it is not unreasonable to claim for Ibn Zur'ah's little treatise several facets of interest to students of cultural and intellectual history.

II. *Translation of Ibn Zur'ah's "Treatise on the Innocence of those who Inquire into Logic and Philosophy"**

|166b6| In the name of God, the compassionate, the merciful. |7| This treatise [or: *epistle*] was composed by Abū 'Īsa ibn Isḥāq ibn |8| Zur'ah for some of his friends. He shows in it |9| the innocence of those who inquire into logic and philosophy |10| from what is reputed [literally: *known*] [of them] of corruption of the religion.

|11| The late Abū 'Alī [literally: *Abu 'Alī, may God be compassionate with him*] said:

It happened, honored sir and master |12| and friend—may God lengthen your life—that I was attracted some time ago by the condition |13| of logic and philosophy and by what great many people of the faith attribute to them, |14| holding that they drive out by this instruction belief in it [viz. religion] and faith |15| in it. I therefore informed you that this is an art [i.e. a statement] of one whose ideas are not trustworthy.

|16| Somebody [then] said: But they do build [their view] upon a

Archives d'Histoire Doctrinale et Littéraire du Moyen Age, vol. 19 (1952), pp. 5–37 (see p. 18). There seems however to be a curious duality here: for Ibn Zur'ah the common man is to put trust in miracles because they violate logic; for Ibn al-Ṭayyib the scholar distrusts them because they do, and demands logical proofs in their place.

* I wish to thank Mrs. Shukrieh Kassis for help with transcribing the manuscript and Mr. Seostoris Khalil for help with the translation. I am especially grateful to Prof. Fadlou Shehadi for reading my typescript and suggesting needed improvements.

very strong basis, namely that |17| "Everything [different] whatsoever corrupts it [viz. another]." [I said:] But this is not so. For the bitterness |18| of taste is not the [same as] whiteness of color, yet one of them does not corrupt the other.

|167a1| I [further] asserted to you, to demonstrate the truth, the need [arising] in the establishment of religious-teachings for |2| a knowledge of philosophy. Those who assert regarding logic that it corrupts in those who know it |3| [adherence to] the religious-teachings have [themselves] reached [a position] of undermining the religious-teachings.

Thereupon you asked me to demonstrate this |4| for you in a written treatise, so that one can make a thorough examination of it, and think about it, and enjoy it. So it seemed to me |5| a necessary duty which there is no avoiding, to answer your request because |6| of the profit to yourself and others. May God make you a cause of good things, and make easy |7| by you and through your hands the means to them.

With this I shall now make a start, |8| with the aid of God, the guide to truths and the provider of benefit for the creatures.

|9| First I say that it is something clearly evident to everyone who knows logic, or |10| who follows the statements of its practitioners [literally: *people*] that it is a discipline whose objective includes discrimination |11| of truth from falsehood in discourse, and distinguishing the good from the evil in action; that it |12| is established for this aim, and is confined to this [objective] in it [viz. its aim].

If someone says that one who inquires |13| into it [viz. logic] and becomes proficient in it disdains the religious-teaching and rejects it on account of his inquiring into it [viz. logic], and that |14| one who inquires into it has his religion corrupted, then his statement about this is of the same force as the statement |15| of one who says that the religious-teaching cannot bear up under investigation and that exact inquiry will corrupt it. |16| He is saying [in effect] that it is not true and that action [in accordance with it] is not good. If this were |17| so, the maker of this statement about this discipline [of logic] and about its practitioners [literally: *its people*] has thereby |18| made a calumny against the religious-teaching, and an insult upon it and its practitioners which could not |167b1| be exceeded. For he is himself like the man who carries glittering dirhams [i.e., coins] |2| with which he escapes from critical examiners and [from] people who know about sensory matters. And [thus] he gains the friendship of those who |3| are not people of knowledge through critical-examination which makes being deceived in it [viz. the matter at issue] possible for them, |4| being impotent in the attainment of truth through critical-examination because of the smallness of their knowledge about it.

|5| This statement [viz. that the study of logic undermines religious faith] is made by people who either (1) have knowledge about what is in it [viz. logic] |6| and understand it well. In this case he [himself is] at the utmost-limit at which it is possible to find a man |7| in the corruption of the religious-teaching and [in] the falsification of it. Because no-one is further-removed |8| from true-acceptance of the religious teaching [than] one who approaches it as one of the people |9| who are agreed respecting it that inquiry into it corrupts it and [that] investigation of it |10| disgraces it and brings to light its deficiencies. Or (2) he [who made this assertion] might be one who makes a statement being overcome |11| by uncertainty. For there are many [engrossed] in imaginings in this way—that the religious-teaching |12| is not really true, and that it is something that is corrupted by an investigation into its state, and that its state is improved |13| by neglect and [blind] submission.

It is necessary for those who say this [themselves] to ward off responsibility for corrupting |14| the religious-teaching. Know that there are two things one or the other of which cannot be avoided. |15| (1) the first of the two is that his statement about this [matter] stemmed from his knowledge about logic, and that it |16| leads *him* to what [i.e. infidelity] was charged against it and against its devotees [literally: *people*] on its account. (2) And the second is that |17| his statement was not based on knowledge of it [viz. logic], but [rather] that he was overcome by the uncertainty of one who does not have information about this [viz. logic].

|18| (1) Now if the one who says this is from among the people who have knowledge of the disciplines of logic and philosophy, |168a1| who [purport to] know how knowledge about this leads them to a corruption of the religious-teaching, |2| the judgment about them [themselves] as innocent of guilt and free from reproach [remains to be established]. For it is evident and clear |3| that this is to be aimed against him on account of his knowledge about it [viz. logic], just as he aims against those of its adherents of whom this [recommended condemnation] is judged. |4| For it is not [proper] for him to condemn as reprehensible in this one of those who know |5| it [viz. logic], but not another, unless he has witnessed the doings in this [matter] of the other whom he singles out for this |6| condemnation respecting his discarding the obligations of the religious-teaching. Otherwise the matter regarding him [himself] and regarding another with respect to |7| knowledge about it [viz. logic] is necessarily the same in both cases. But nothing appears respecting him that necessitates that he [himself] is innocent [of corrupting religion], |8| and [this] in accordance with his own statement.

(2) Or else the one who says this is not [himself] from among the people [who are devotees] of these two |9| arts [i.e., logic and philosophyl], but is led in it by what has [previously] been denounced about them by some of the people who are opponents |10| to them [i.e., these disciplines]. But then he becomes, by this statement [of condemnation] a departer from the authoritative religious-teaching |11| about the innocence of guilt and freedom from reproach of certain people in regard to accusations |12| that may very possibly be false, for not every accusation is true. In this act [viz. yielding one's own opinions to pressure] |13| there is a departure from the required-duty in accordance with the principles of the religious-teachings and its exponents, and in accordance with |14| plain right itself—namely that judgment by one who accepts the religious-teachings |15| must be based upon what is known, and not upon what is mere conjecture. There is no disagreement among the people of the religious-teaching |16| that judgment based on conjecture is erroneous and confused.

Thus the defects of opinion have been made manifest |17| [in the accusation] against these two disciplines [viz. philosophy and logic] and their practitioners [literally: *people*] through what we have said, which I trust |18| will deter those who peruse this treatise [or: *epistle*] from venturing upon it [viz. the condemnation of philosophy and logic]. Because this discourse, |168b1| according to my opinion, will reveal to him that which may perhaps show him what is the case, and will make easy our approach to him, |2| and put him close to us, and disclose [our ideas] to him in detail and at length.

|3| Thus [we now turn] to the need which every genuine religious teaching has for [assuring] belief |4| in it, for philosophy; so that knowledge of it [i.e., the religious teaching] can be certain, and that without this [certification] it [i.e., religion] will not reach |5| this goal [i.e., being certified as belief-worthy]. I shall now give a demonstration of this.

I say that |6| the religious-teachings belonging to the different nations are established by miracles which attract the minds |7| of those who are summoned to them [i.e., the religious-teachings] so that they are led [to accept] those [teachings] which they were summoned to accept. There is not excepted from |8| this principle a single one of its [i.e., the nation's] people, and no one finds an excuse for himself to accept something else, |9| unless that is established to him by a miracle that exempts him from this [previous] declaration, [and] which declares |10| that he and no one beside him is to be excepted. If this principle is securely established as being correct, |11| belief in it is necessary.

Miracles are in fact actions which |12| are [not] in our capacity and in human nature, and are thus impossible in accordance with [our]

nature. |13| [But] for him who summons us to the religious-teaching to which the people submit, they are possible, |14| their easy performance being a simple matter for him. Thus the word "miraculous" contains what would mean |15| the incapacity of the nature which calls the thing "miraculous" to produce something like it.

|16| If someone says that something is to be called miraculous because it is beyond the capacity of certain people but not |17| others, so that it is not necessary for the thing said to be miraculous that it be constantly beyond the capacity |18| of all people, then know that he has [thereby] made easy the way for |169a1| attaining the performance of miracles and made ready the access of attainment to them. |2| The workers [of miracles] with their instruments have produced something such that other people and the people of their time are incapable of [producing] |3| its like. This deed was not something such that it pertained properly to man to have the mastery over |4| its like, because of the nonexistence of the means at the time for [people to do] something like it. Thus it becomes |5| in this way justified for the workers [of miracles] to make claims to miracles, [and then] this judgment makes it necessary to believe in them |6| and thus they become prophets [literally: *men who summon*] on account of this. This opinion necessitates acceptance of their summons and entry |7| into [the teachings of] their like because of the establishment by a miracle. But this is the height of corruption and the extremity of corrupting and the extremity |8| of darkness; because this produces many foolish people whom the intellect prevents |9| from following things easy and near-at-hand, let alone the remote |10| and difficult.

[However,] if the clear method for the acceptance of the statements of a prophet [literally: *one who summons*] |11| is only the submission to the miracles which we have defined—namely those shown to be impossible |12| in the course of nature with respect to the nature of man, and which have been established [as possible] to the prophet [literally: *the one who summons*] in a way that is super- |13| natural and nobler [than the natural]—this [result] could not be attained, and there could be no way to |14| comprehend it in any manner clearer and more primary than by certain knowledge of what is possible |15| or impossible or actual [literally: *that whose existence (or actuality) happens*]. So that there will be belief in that |16| to which we are summoned by him who has performed the [miraculous] deed because it has been established for us with certain knowledge that this is impossible |17| by natural means and is infeasible for anyone other than him [i.e., the prophet].

This requisite, and the method aiming |18| towards its attainment are only [possible] by philosophizing, by whose means one knows the

possible |169b1| and the absolutely impossible in all things. If it is philosophizing |2| that makes known to us the possible in [the various] matters, and the impossible in them, and if our knowledge |3| about these [matters] makes it necessary for us to be led [to accept] certain matters |4| and prophecies, and to comprehend some of them [i.e., prophecies] in order to ascertain the miraculous in some of them |5| or the corruption of others—then there is nothing as important for the religious-teaching as the truth, and nothing more needed |6| by it than philosophizing if it is truth we are seeking, and avoiding what differs from it.

|7| An example of this [is as follows]: If we did not know it to be a natural fact that bringing to life a dead man |8| is impossible with respect to the nature of man, knowing this as certain, we would not have reckoned this as the miracle of one who performed it. |9| And if the true conditions regarding complete loss of vision of the eye were not known to us, |10| we would not accept as true a summons attained |11| through a loss of its loss. This [is so] because the art [of medicine] |12| includes—[in the case of] some diseases of the eye in which there is loss of the functioning of vision |13| because of [limited] loss of the power for it [i.e., vision]—the restoration of its functioning to it [viz. the eye]. This is certification to us for the belief |14| which we have—because of this miracle [of restoring vision to a blind man]—in the word and deed that summon us to him, which [i.e., word and deed] are only |15| near to the true and the right when this [attesting miracle] is known by us.

Sometimes the loss of power |16| in that sight is [naturally] attributable to the sight and does not stem from the lack of [all capacity for] action, and [then] we say that |17| the art [of medicine] and nature encompass its removal by methods described |18| and specified in medical books, [together with] the measures that lead to this [removal]. But as to [the case in which] |170a1| the loss of the power [of vision] [is complete], then neither the art [of medicine] nor nature can restore it. Indeed this can only be |2| by a nobler power, and we are obliged to give obedience to it and to submit to the one who performs it, |3| for it deserves our honor and respect.

If this is the case, it is consequently |4| clearly true that there is a need for philosophizing in the acceptance of religious-teaching, not by way of |5| belittling it [religion] but as a necessity. Plain has become the disgracefulness of the claim that the discipline |6| of logic corrupts the religion of those who inquire into it. Thus is destroyed [all] excuse of those who say |7| this after examining the considerations we have given and completing [perusal of] what we have described. "To God be thanks without end."

VII

THE LOGIC-CHAPTER OF MUḤAMMAD IBN AḤMAD AL-KHWĀRIZMĪ'S ENCYCLOPEDIA, KEYS TO THE SCIENCES (*c.* A.D. 980)

I. *Introduction*

Abū 'Abd-Allah Muḥammad ibn Aḥmad ibn Yūsuf al-Khwārizmī flourished in Persia in the second half of the 4th century of Islam (10th century A.D.).[1] Around A.D. 980 he composed in Arabic the first scientific encyclopedia of the Muslims. Under the title *Mafātīḥ al-'Ulūm*, "Keys to the Sciences," al-Khwārizmī gave a compact account of each of the scientific disciplines known in his time and place. This encyclopedia was edited by G. van Vloten in 1895,[2] and has long been recognized by Orientalists as a work of great importance for the study of the intellectual history of Islam. It has never been translated into any Western tongue.[3] My aim here is to give an English translation of the chapter which al-Khwārizmī's book devotes to logic, and to prefix to it some explanatory remarks regarding the character of this discussion and its significance for the history of Arabic logic.

A preliminary word must be said about al-Khwārizmī's conception of the place of logic among the sciences. His encyclopedia is divided into two parts, in line with the customary Arabic classification of the sciences into the indigenous Islamic sciences on the one hand, and the exogenous (primarily Greek) sciences upon the other. The former division includes chapters on jurisprudence, scholastic theology,

[1] For al-Khwarizmī's life and work the following reference-works may be consulted: (1) G. Sarton, *Introduction to the History of Science*, vol. I, Baltimore, 1927, pp. 659–660; (2) E. Wiedemann, "Al-Khwarizmī," *Encyclopedia of Islam*, vol. II, Leyden-London, 1927, p. 913; (3) C. Brockelmann, *Geschichte der Arabischen Litteratur*, vol. I, Weimar, 1898, p. 244; and *Supplementband* I, Leiden, 1937, pp. 434–435.

[2] *Liber Mafatih al-Olum*; auctore Abu Abdallah Mohammed ibn Ahmed ibn Jusof al-Katib al-Khowarezmi. Edidit G. Van Vloten, Ludguni-Batavorum 1895.

[3] Sarton expressed the opinion that "An English translation is badly needed" (*loc. cit.*). However, a number of discussions in al-Khwarizmī's encyclopedia relating to the natural sciences were analyzed, and some material translated into German, in a series of ten studies by E. Weidemann published in the *Sitzungsberichte der physikalisch-medizinischen Sozietät in Erlangen*, vols. 38–54 (1906–1923); see Wiedemann *op. cit.* for detailed citations. E. Seidel studied "Die Medizin im *Kitab mafatih al-'ulum*" in the same *Sitzungsberichte*, vol. 47 (1915), pp. 1–79. J. M. Unvala has published in English "*The Translation of an Extract from Mafatih al-'Ulum, of al-Khwarizmi*," *Journal of the K.R. Cama Oriental Institute* (Bombay 1928), No. 11.

grammar, administration, prosody, and history. The latter division includes chapters on philosophy, logic, medicine, arithmetic, geometry, astronomy, music, mechanics, and alchemy. The discussion of logic here translated thus forms the second chapter (*bab*) of the second part (*maqalah*) of al-Khwārizmī's book. As the reader will see, this chapter fully accords with Sarton's characterization of the "Keys to the Sciences" as less of an encyclopedia than "a classified vocabulary of technical terms" (*loc. cit.*).

Al-Khwārizmī's treatment of logic follows the neo-Aristotelian division of this subject into nine branches, as traditional in Arabic logic, following in the footsteps of Hellenistic and Syriac writers on logic. This division is as follows:

Branch	*Arabic Name*	*Basic Text*
(1) "Introduction"	al-īsaghūjī	*Isagoge* (Porphyry)
(2) Categories	al-maqulat	*Categoriae*
(3) Hermeneutics	al-'ibārah	*De Interpretatione*
(4) Analytics	al-qiyās	*Analytica Priora*
(5) Apodictics	al-burhan	*Analytica Posteriora*
(6) Topics	al-jadal	*Topica*
(7) Sophistics	al-mughālitah	*Sophistici Elenchi*
(8) Rhetoric	al-khiṭabah	*Rhetorica*
(9) Poetics	al-shi'r	*Poetica*

Al-Khwārizmī devotes a separate section (*fasl*) to each of these nine branches. A given branch, however, does not always conform rigidly to the topical coverage of its basic text. For example, al-Khwarizmī treats of "objection" and "example" in Apodictics, although Aristotle's discussion of these items occurs in *Anal. Pr.*

Arabic logicians customarily referred to the first four of the basic texts as "the four books" of logic, and to the first eight as "the eight books." (The *Poetica* was often dropped from the logical Organon; al-Khwārizmī, who includes it, gives some evidence of misgivings.) The earlier generation of Arabic logicians generally confined themselves to the logic of "the four books." The Syriac Christian logicians, through whose hands Greek logic reached the Arabic-speaking peoples, tended to distrust the *Analytica Posteriora* as a source of potential difficulties for theology and to concentrate on its predecessors in the logical Organon. It is, I believe, as a result of this, that al-Khwārizmī, who apparently relies on the older sources, treats only "the four books" with some measure of adequacy, and is superficial in the extreme as regards the rest of the logical Organon.

So far as the substantive logical ideas presented by al-Khwārizmī are concerned, one passage that merits comment is the examination of

the validity conditions (*khassah* = a "special condition" for the validity of a categorical syllogism) in the Fourth Section. Here, instead of only *general* validity conditions for categorical syllogisms in all figures (of which al-Khwārizmı does indeed list six), we find that most of these rules are relativized to some particular syllogistic figure. Of course the shortcomings must be laid at the door not of our encyclopedist author, but of his sources.[3a]

It deserves remark that the Greek names of the logical treatises are recorded by al-Khwarizmī, and their meanings explained, mostly in an essentially correct manner. With later Arabic logicians this became a matter of much misunderstanding and confusion. For example in the commentary by Khair-al-Dīn al-Ghazāwī (fl. A.D. 1450) on the popular compendium of logic *Īsaghūjī fī-'l-manṭiq* of al-Abharī (d. A.D. 1264), the author explains that *īsaghūjī* is the Syriac expression for the five predicables, and states two theories to explain this designation: (1) that it is the name of the philosopher who first elucidated the predicables, and (2) that it is the name of a dull pupil of an early philosopher to whom this particular work had to be explained at great length. The same two explanations are repeated in the commentary on al-Abharī's book by Zakariyyā' al-Anṣārī (d. A.D. 1520), where however the correct explanation (that *īsāghūjī* is Greek for Arabic *madkhal*, i.e., "introduction") is ranged alongside of them as a third possibility.[4]

I have already observed that al-Khwarizmī's treatment gives evidences of reliance on the very earliest generation of Arabic translations of logical texts. One illustration of this is that in the section on *Categoriae* (the second), al-Khwārizmī informs us that Ibn al-Muqaffa' calls substance *al-'ayn* instead of the customary *jauhar*, thus providing one of the few concrete indications we possess regarding the work of this earliest of Arabic writers on logic, whose works have long been lost.[5] Further, al-Khwārizmı himself follows earlier usage in speaking of *summum genus* as *jins al-jinas* instead of *jins 'alin*, and in using *naw' al-anwā'* as the designation of *infima species*, *naw' akhīrah*. Comparable terminological primitivism is evidenced in certain other points, such as

[3a] Al-Khwarizmī borrows definitions of technical terms of philosophy from al-Kindī. See S. M. Stern in the *Journal of the Royal Asiatic Society*, 1959, pp. 42-43.

[4] See pp. 76–77 of E.E. Calverly's English translation of "Al-Abharī's 'Isaghujī fī-'l-manṭiq' " in the *D.B. Macdonald Memorial Volume*, Princeton, 1933, pp. 75–85.

[5] The attribution of logic-treatises to Abu 'Amr 'Abd-Allah ibn al-Muqaffa' (d. A.D. 759), the famous translator of *Kalīlah wa-Dimnah*, the Persian "Fables of Bidpai," is for various reasons so implausible, that several authorities rejected such works as figments of the imagination of later bibliographers. However, Paul Kraus showed in 1934 that the logician is the obscure son of this famous author, Muhammad ibn 'Abd-Allah ibn al-Muqaffa' (d. *c.* A.D. 800), who wrote short epitomes of "the four books" of logic, drawn from Syriac sources. ("Zu Ibn al-Muqaffa'," *Rivista degli Studi Orientali*, vol. 14 (1934), pp. 1–20.)

the designation of the category of *quality* by *kaif* = "how?" instead of *kaifiyyah* = "how-ness."

Al-Khwarizmī's treatment of the subject is thus of interest for the study of the evolution of logic in Islam from various points of view. It is of philological interest both in that it is a source of information regarding the growth of Arabic logical terminology, and in that it contains a number of technical terms of Arabic logic not included in the Western lexicons.[6] More significant yet is its systematic interest as a valuable document for the development of logical theory among the Arabic-speaking peoples.

In one particularly ill-omened respect al-Khwārizmī's discussion of logic is well ahead of its time: its hasty and superficial survey of the subject falls into the pattern for the writing of logic manuals which were so popular in medieval Islam. Such a format on the one hand rendered a penetrating discussion of the subject impossible, and on the other hand called out for the proliferation of commentaries and supercommentaries that focussed attention on the explanation of texts instead of the development of their underlying subject matter. Just this ultimately rendered Islamic logic a stylized and sterile affair.

II. *Translation of the Logic-Chapter of al-Khwārizmī's* Keys to the Sciences

First Section—*Isagoge*

[141, line 6][7] This science is called in Greek *lūghiya*, and in Syriac *milīlūthā*, and in Arabic *manṭiq*. Isagoge is the introduction [to this science]. It is called *īsaghūjī* in Greek.

An *individual* (*shakhs*) for logicians is [a particular] like *Zaid* and *'Amr* and *this man* and *that donkey* and [*that*] *horse*. Sometimes this is called a *particular thing* (*'ain*).

A *species* (*naw'*) is [a kind] like *man in general* and *donkey* and *horse*. It includes individuals such as *Zaid* and *'Amr* and *this horse* and *that donkey*. These fall under it; it is universal (*kulliyy*) and includes individuals.

A *genus* (*jins*) is that which is more general than a species, like *living being* which is more general than *man* and *the horse* and *the donkey*.

The *summum genus* (*jins al-jinas*) is that [genus] which is such that no genus is more general than it, such as substance (*jauhar*). An *infima species* (*naw' al-anwā'*) is [a species] such that there is no species more special

[6] Some of these technical terms are not listed in the most extensive specialized vocabularies of philosophical Arabic, such as that of M. Horten, *Die Spekulative und Positive Theologie des Islams*, Leipzig, 1912; or that of A. M. Goichon, *Lexique de la Langue Philosophique d'Ibn Sīna*, Paris, 1938.

[7] These bracketed numbers refer to the pagination of Van Vloten's edition of our text, as cited above.

than it, |142| such as *man* and *the horse* and *the donkey*, which are such that only individuals fall under them. Every species is intermediate between an *infima species* and the *summum genus*.[8]

"Being a species" is a status relative to that which is more general than it, and "being a genus" is a status relative to that which is more special than it; as, for example, *living being* and *bodied thing* [are species and genus, respectively, relative to one another].

A *difference* (*fasl*) is that which sets apart one species from another of the same nature (*dhat*) [i.e., of the same genus]. From genus and difference there arises the *definition* (*ḥadd*). An example of this is the definition of *man*—he is the *rational animal*. In this statement, *animal* is the genus and *rational* is the difference.

An *accident* (*'arad*) is that which sets apart particular thing from particular thing [of the same species and so] not by its nature; such as *whiteness* or *blackness* [in man] or *heat* or *cold* [in, e.g. a stone] and that sort of thing. A *proprium* (*khaṣṣah* = "inseparable accident" or "general accident") is an accident which always characterizes a particular species, like *laughter* in man, and *braying* in the donkey, and *barking* in the dog.

From genus and proprium there arises the *description* (*rasm al-shai'*), as in the statement, "Man is a laughing animal."

The [logical] *subject* (*maudu'*) corresponds to what the grammarians call the [*grammatical*] *subject* (*mubtada'*). This is what requires a [grammatical] predicate (*khabar*), and it [i.e., the subject] is the thing characterized [by the predicate].

The [logical] *predicate* (*maḥmul*) corresponds to what they [i.e., the grammarians] call the *predicate of the subject* (*khabar al-mubtada'*), and this is the grammatical predicate (*ṣifah*). For example, in the sentence "Zaid is a clerk," *Zaid* is the [logical] subject, and *clerk* is the [logical] predicate (*maḥmul*), meaning that it is the [grammatical] predicate (*khabar*) [also].

Second Section—*Categoriae*

|143| The first book of Aristotle's books on logic is called *Categoriae* (*Qaṭighuriyās*). As for the *Isagoge*, it is by Porphyry, who wrote it as an introduction to the books on logic [of Aristotle]. The meaning of *qaṭighuriyas* in Greek relates to the categories (*maqūlāt*). The categories are ten in number and are called *qāṭāghuriyat* [in Greek].

The first of them is *substance* (*jauhar*). This is everything that exists, such as *the sky* and *the stars* and *the earth* and its parts, and *water* and *fire* and *air* and the [various] kinds of *plants* and of *animals* and the members

[8] Regarding this terminology see the foregoing "Introduction."

of every one of them. 'Abd-Allāh ibn Muqaffa'[9] calls substance (*jauhar*) *particular thing* (*'ain*), and the common people call the categories likewise. The rest of what is mentioned in the sections of this chapter by their [technical] names, the practical people toss aside; therefore I leave off notice of them, and I explain what is well known about these matters.

The second category is *quantity*, *al-kamm*, with double *m* because *kam* (= "how much?") is a "defective term" (*ism naqiṣah*) for the grammarians. Defective terms and abstract particles (sing. *ḥarf al-ma'anī*) are made into complete terms (sing. *ism tammah*) through introduction of the article *al*, or through Arabizing by doubling one of the two consonants and declining [the result in the regular way]. Abū Zaid[10] wrote:

> If I only knew what would become of me,
> Truly the if-only and the if-but are a burden.

Everything, then, falls under the question "how much?" and so it is on this account a category.

[With regard to] everything |144| it is possible to determine the totality in terms of its parts, such as *the line* and *the plane* and *the solid* and *time* and *wealth*. The line and the plane and the solid have already been treated in the chapter on geometry.

The third category is *quality* (*kaif* = "how?"). This [too] is such that everything falls under the question "how?" (= *kaif*). It concerns the characteristics of things: their circumstances and colors, tastes, odors and "feels"—such as hotness and coldness and dryness and moistness—and the characters and personality traits, such as *fearful* and *shy* and such-like.

The fourth category is called *relation* (*iḍāfah*). This is [concerned with] the relationship (*nisbah*) of two things inclining the one towards the other, such as *father to son* and *slave to master* and *brother to brother* and *partner to partner*.

The fifth category is the category of *time* (*matā* = "when?"). This is [concerned with] the relationship (*nisbah*) of a thing to time (*zaman*) as defined by the past, the present and the future, like *yesterday* and *today* and *tomorrow*.

The sixth category is the category of *place* (*aina* = "where?"). This is [concerned with] the relationship (*nisbah*) of a thing to its place (*makān*), as in the expressions "in the house" or "in the city" or "in the universe."

The seventh category is *position* (*waḍ'*) and it is [also] called *situation*

[9] See footnote 5 of the foregoing "Introduction."
[10] Presumably Abū Zaid al-Anṣarī, fl. 780 (see Brockelmann, GAL, I, 104).

(*nuṣbah*). This is like *standing* and *sitting* and *lying* and *rearing up* in animals and such-like in other [i.e., inanimate] things.

The eighth category is the category of *possession* (*lahu* — "he has" or "to have") [i.e., *state*]; some [logicians] call it the category of *ownership* (*dhu*) and some call it |145| *state* (*al-jidah*). This is [concerned with] the relationship (*nisbah*) of a body to the body covering it over its whole extension or over a part of it. For example the *clothing* and *shoes* and *armor* of a man and the *bark* of a tree.

The ninth category is the category of *passion* (*yanfa'il* = "to be acted on"). Passion (*infi'al* = "being acted on') is the reception of the effect of an affecting agent.

The tenth category is the category of *action* (*yaf'al* = "to act"). And this is the affecting of a thing that receives an effect, like *heating*—where passion is like being heated—and *cutting* and [passion here is] being cut.[11]

Third Section—*De Interpretatione*

The name of the second book [of Aristotle's logical writings] is *Peri Hermeneias* (*Barī Irmīniyas*). This means "guides to interpretation (*tafsīr*)," for among the things considered in it is the *name* (*ism*) and the *verb* (*kalimah*) and *copulas* (sing. *ribāṭah*).

A *name* (*ism*) is every single utterance referring to a meaning, but without referring to a limited time, such as "Zaid" and "Khalid."

A *verb* (*kalimah*) is that which the Arabic-speaking people call an *action* (*fi'l* = "action" or "verb"). Its definition for logicians is: every single utterance referring to a meaning, and [also] referring to a limited time, like "he walked" and "he walks" and "he will walk" and "he is engaged in walking."

Copulas (sing. *ribātah*) are what the grammarians call *abstract particles* (sing. *harf al-ma'anī*) and some of them call them *particles* (sing. *adāh*).

|146| *Surrogates* (sing. *khalīfah*) are what the grammarians call *demonstrative pronouns* (sing. *ism al-mubhamah*) and *personal pronouns* (sing. *ism al-mudmarah*). These are a replacement for names, like "I" and "you" and "he."

A *statement* (*qaul*) is that which is composed of a name (*ism*) and a verb (*kalimah*).

A *quantity indicator* [or: *quantifier*] (*sūr*) for logicians is [an expression such as] "all" and "some" and "one" and "not all" and "not one" and "not some."

An *assertoric statement* (*qaul al-jazim*) is a declaration [*khabar* = "declara-

[11] This ordering of the categories does not derive from the *Categoriae*, but from the *Topica* (I, 9).

tion," and not here "predicate"] as opposed to a command and a request and a question and a proclamation and such-like.

A *proposition* (*qaḍiyyah*) is an assertoric statement, like "So and so is writing" or "So and so is not writing."

An *affirmative proposition* (*qaḍiyyah al-mūjibah*) is one that attributes a thing to a thing, like the statement "Man is a living being." A *negative proposition* (*qaḍiyyah al-sālibah*) is one that denies a thing of a thing, like the statement "Man is not made of stone."

A *determinate proposition* (*qaḍiyyah al-maḥṣūrah*) is one that has a quantity indicator. An *indeterminate proposition* (*qaḍiyyah al-muḥmalah*) is one that has no quantity indicator.

A *universal proposition* (*qaḍiyyah al-kulliyyah*) is one whose quantity indicator generalizes in the affirmative or the negative, like the statement "Every man is a living being" or "No man is a stone." A *particular proposition* (*qaḍiyyah al-juz'iyyah*) is one that does not generalize, like the statement "Some men are clerks" or "Not all men are clerks."

Modalities (sing. *jihah*) in propositions are like the expressions "necessary" or "impossible" or "possible." An *absolute proposition* (*qaḍiyyah al-muṭlaqah*) is one that does not have any modality.

Fourth Section—*Analytica Priora*

|147| This book is called *Anūlūṭīqā* in Greek, which means *conversion* (*'aks*), because it considers the changing about of premisses (sing. *muqaddamah*), and which of them can be converted and which cannot be converted.

A *premiss* (*muqaddamah*) is a proposition that leads the way in the construction (*ṣan'ah*) of a syllogism (*qiyās*).

The *conclusion* (*natījah*) is that which results from two premisses. For example [consider] the statement "Every man is a living being *and* Every living being is a being that sleeps." Here then the conclusion which is [forthcoming] between these two premisses is the proposition "Every man is a being that sleeps." It [i.e., the conclusion] is also called the *consequent* (*ridf*).

A "*connection*" (*qarīnah*) is [made by] the two premisses when they are united [by a common—i.e., middle—term]. A "*union*" (*jāmi'ah*)is [made by] a "connection" and a conclusion when they are united [in their terms]. It is also called a *construction* (*ṣan'ah*). Its name in Greek is *sūlūjismūs*, i.e., *syllogism* (*qiyās*).[12]

An *attributive premiss* (*muqaddamah al-ḥamliyyah* = "categorical premiss") is a compound of a name (*ism*) and a verb (*kalimah*) only.

[12] On the terminology of this section, taken over from Alexander of Aphrodisias, see N. Rescher, "Some Technical Terms of Arabic Syllogistic Logic," *Journal of the American Oriental Society*, vol. 82 (1962), pp. 203–204.

A *conditional premiss* (*muqaddamah al-shartiyyah*) is a compound of two attributive premisses and of conditional particles (sing. *ḥarf al-sharṭ*), like the statement "If the sun has risen, then it is day [literally "then day exists"]" and the statement "A number is either even or else odd."

An *attributive syllogism* (*qiyas al-ḥamliyy*) is composed of two premisses which share in common one single term (*ḥadd*).[13] |148| This shared term is called the *middle term* (*ḥadd al-ausaṭ*). The two remaining terms are called the *extremes* (sing. *ṭarf*).

Now if the middle term occurs as subject in the first of the two premisses, and as predicate in the other [premiss], this ordering is called the first *figure* (*shakl*) of the figures of the syllogism. When it [i.e., the middle term] occurs as predicate in both of them together [i.e., in both premisses], it is the second figure. And when it [i.e., the middle term] occurs as subject in both of them together [i.e., in both premisses], it is called the third figure.[14]

The *major premiss* (*muqaddamah al-kubra*) is that in which the *major term* (*ḥadd al-akbar*) [occurs], and this [i.e., the major term] is the one which occurs as predicate in the conclusion. The *minor premiss* (*muqaddamah al-ṣughra*) is that in which the *minor term* (*ḥadd al-asghar*) [occurs], and this [i.e., the minor term] is the one which occurs as subject in the conclusion.

The special conditions (sing. *khaṣṣah*) for [all] the three figures are: (i) that [a valid conclusion] does not result from two negatives [as premisses], (ii) nor from two particulars, (iii) nor from two indefinites, (iv) nor from an indefinite [premiss] and a particular [premiss], (v) that the shared [i.e., middle] term does not occur in the conclusion, and (vi) that [when the premisses differ in quality or quantity] the conclusion will exhibit the more specialized quantity and quality of the two premisses. I mean by "the more specialized in quantity" the particular [in contrast to the universal] and by "the more specialized in quality" the negative [in contrast to the affirmative].

The special conditions for the first figure are (i) that the major [premiss] be universal, |149| (ii) the minor [premiss] be affirmative, and (iii) the conclusion be of a quality that agrees in affirmativeness or in negativeness [with the major] and [of a quantity that agrees] in universality or in particularity [with the minor].[15]

The special conditions for the second figure are (i) that the major

[13] This term has a range of meanings similar to those of Greek *horos*, normally = "limit"; but in logic, technically, "definition," and also, as here, "term."

[14] Note the absence of the fourth figure, as is common (although not universal) among the Arabic logicians.

[15] Without the indicated interpolations, al-Khwarizmī's statement of condition (iii) is neither good sense nor good logic.

[premiss] be universal, (ii) that the major and its minor differ in quality, and (iii) that its conclusion be always negative.

The special conditions for the third figure are (i) that the minor [premiss] be affirmative, (ii) that the major [premiss] be of a quality that falls into [i.e., is the same as] the quality of the conclusion,[16] and (iii) that the conclusion be particular.

The *conclusion-yielding connections* (sing. *qarinah al-natijah*) in the three figures are eight in number:

(1) A universal affirmative major [premiss] and a universal affirmative minor yield in the first figure a universal affirmative [conclusion] and in the third an affirmative particular. [AAA–1 and AAI–3; i.e., *Barbara* and *Darapti*.]

(2) A universal affirmative major [premiss] and a universal negative minor yield in the second figure a negative universal [conclusion]. [AEE–2; *Camestres*.]

(3) A universal affirmative major [premiss] and a particular affirmative minor yield in the first figure and the third figure a particular affirmative [conclusion]. [AII–1 and AII–3; *Darii* and *Datisi*.]

(4) A universal affirmative major [premiss] and a particular negative minor [must] yield in the second figure a negative particular [conclusion] to ward off impossibility. [AOO–2; *Baroko*.]

(5) A universal negative major [premiss] and a universal affirmative minor yield [a valid conclusion] in all three figures. As for the first and the second [the conclusion] must here be negative universal; and as to the third, [the conclusion] must here be negative particular. [EAE–1, EAE–2 and EAO–3; *Celarent*, *Cesare*, and *Felapton*.]

(6) A universal negative major [premiss] and a particular affirmative minor yield in [all] the three figures a negative particular [conclusion]. [EIO–1, EIO–2 and EIO–3; *Ferio*, *Festino*, and *Ferison*.]

[16] The Arabic text of (ii) actually bears the meaning: "that the major (premiss) be of a kind (or: *quality*) that falls in (or: *into*) the quality and quantity." My translation would in effect require "and quantity" (*wa-l-kammiyyah*) to be a mistake for "of the conclusion" (*li-l-nātijah*). As this is not a mistake of the sort that could arise in manuscript transcriptions, it must have stood in al-Khwarizmi's original text. Together with the passage discussed in the preceding footnote, I take this as proof that al-Khwārizmī copied from his logic sources with relatively little understanding of the materials at issue. The logical facts are these: If we consider all of the applicable rules for the one in question here, we find only three third-figure syllogisms over and above the six valid ones (AAI, IAI, AII, EAO, OAO, and EIO), namely AAO, AIO, and IAO. The additional rule must therefore be such as to countenance the former six, but disallow these three moods. The only condition to be put on the major premiss which accomplishes this is the requirement that its quality be the same as that of the conclusion. Thus my proposed rendition.

(7) A particular affirmative major [premiss] |150| and a universal affirmative minor yield in the third figure a particular affirmative [conclusion]. [IAI–3; *Disamis*.]

(8) A particular negative major [premiss] and a universal affirmative minor [must] yield in the third figure a particular negative [conclusion] to ward off impossibility [OAO–3; *Bokardo*].[17]

Fifth Section—*Analytica Posteriora*

This book is called *Afūdiqṭīqā*, which means "clarification"; for in it the sound (*saḥīḥ*) syllogism and the unsound are clarified.

The foundations of demonstration (*usūl al-burhān*) are the *basic truths* (*mabadi'*) and the *first premisses* (*muqaddamāt al-uwwal*). These are those [propositions] which people in general know, like the proposition "The whole is greater than the part" or "Things equal to one and the same thing must be equal [to each other]."

The *material cause* (*'illah al-hayulaniyyah*) is [bound up with] knowledge of the "whether" (*hal*) of a thing. The *formal cause* (*'illah al-suriyyah*) is [bound up with] knowledge of the "what" (*mā*) of a thing. The *efficient cause* (*'illah al-fā'iliyyah*) is [bound up with] knowledge of the "how" (*kaifa*) of a thing. The *final cause* (*'illah al-limā'iyyah*) is [bound up with] knowledge of the "why" (*lima*) of a thing.

Demonstration (*al-burhān*) is demonstrative argument (*ḥujjah*). *Objection, al-khalf*, spelled with *a* after the *kh*, is the annihilation of an opposed proposition by one set against it.

Induction (*al-istiqra'*) is the knowledge of a universal matter through a collection of its individual instances. It is said that someone makes an induction about villages and the houses of a street when [he describes them after] he has walked around them |151| and has not set foot in them.

An *example* (*mithāl*) exists when one singles out one individual of a plurality of [similar] individuals in order to point towards them by means of it.[18]

Sixth Section—*Topica*

The name of this book is *Topica* (*Ṭubīqa*) which means "the places," i.e., the places of a statement. Disputation (*jadal*) is considered in it.

The meaning of "disputation" is the [technique for] deciding about an opponent [in a dispute] in accordance with what he has brought forward; with a view to deciding that it is true or false; or with a view to

[17] The completeness and correctness of this list should be noted.

[18] Sometimes, "example" is used in Arabic logic as a technical term for *analogy*. (See M. Horten, *Die Philosophischen Ansichten von Razi und Ṭusi*, Bonn, 1910, p. 6.) The usual Arabic word for analogy, viz. *qiyās*, is pre-empted by the syllogism.

[deciding] that it is not possible for one opponent to be resisted, on account of the reputability of his belief and his opinion about it [i.e., the matter at issue], because this would be an insult to his belief and his opinion about it.

Seventh Section—*Sophistici Elenchi*

This book is called *Sophistica* (*Sūfistīqā*), which means "arbitrariness": a Sophist being one who makes arbitrary judgments. The sources of deceptions (sing. *mughaliṭah*) are considered in it, and how to guard against them. Sophists are those who do not determine the true facts about things.

Eighth Section—*Rhetorica*

This book is called *Rhetorica* (*Rīturīqa*), which means "public speaking" (*khatabah*). There is discussion in it about |152| matters of persuading. *Persuasion* (*iqnā'*) means [a mode of reasoning by which] the mind of the hearer is convinced by a statement with which he concurs, but without demonstration (*burhan*).

Ninth Section—*Poetica*

This book is the ninth of the books of logic. It is called *Poetica* (*Buyuṭīqa*) which means "poetry" (*shi'r*). There is discussion in it about *representation* (*takhyīl* = "imaginative representation," especially drama). "Representation" means the excitation of the mind of a hearer towards pursuit of a thing or flight from it, but without his being truly convinced of it.

Representation and *portrayal* (*taṣawwur*) and *imitation* (*tamaththul*) and things resembling these, are [the matters] treated in this book for the most part, and besides them [also] *crisis* (*azmah* = Aristotle's *krisis*) and *complication* (*muta'addiyyah* = Aristotle's *ploke*).

It is said that I portray a thing when I intend to [produce] a portrayal of it in your mind and to imitate it and to represent it as such and such. However a representation of me and an imitation of me and a portrayal of me—all these are [types of] knowledge. The proof of this is that [in representation, etc.] I recognize it [i.e., the object represented] so that it is recognizable by me, and I reach conviction about it so that it is convincing to me.[19]

[19] Note that this final paragraph is devoted to justifying the inclusion of *Poetica* in the logical Organon. Apparently al-Khwārizmī had misgivings on this point.

VIII

AVICENNA ON THE LOGIC OF "CONDITIONAL" PROPOSITIONS

I. *Introduction*

Like most of the notable medieval Arabic philosophers working in the Aristotelian tradition, Abū ʿAlī al-Ḥusain ibn ʿAbd-Allāh ibn Sīna, better known under the Latinized name of Avicenna (980–1037), wrote extensively on logic. In their logical works, the Arabian philosophers invariably hewed to their Greek sources with painstaking care. It is consequently of some interest to find in Avicenna a discussion of the logic of hypothetical and disjunctive propositions which, beginning from a point of departure that is clearly Greek, and indeed Stoic in origin, goes beyond the discussions hitherto found in the accessible sources. The object of the present paper is to throw some light upon this chapter of Avicenna's logic.

II. *"Conditional" Propositions*

Avicenna distinguishes between "attributive" (Arabic: *hamliyyah*) propositions, which ascribe a predicate to a subject, or deny it to the subject,[1] and "conditional" (*shartiyyah*) propositions, i.e., compound propositions each of whose constituent propositions are displaced from their ordinary assertive function to play another role (I, 115). The paradigm examples of "attributive" propositions are "Man is an animal" and "Man is not a stone" (I, 116–117; D, 36). In the full light of his discussion, Avicenna's "attributive" propositions are readily seen to correspond to *categorical* propositions. The paradigm examples of "conditional" propositions are "If the sun shines, it is day" and "Either

[1] *Livre des Directives et Remarques* (*Kitab al-Ishārat wa-'t-Tanbīhat*), translated by A. M. Goichon (Paris and Beyrouth, 1951), p. 114. [This work is henceforth cited as "I".] *Le Livre de Science* (*Danesh—name*), pt. I (Logic and Metaphysics), translated by M. Achena and H. Masse (Paris, 1955), pp. 36–37. [This work is henceforth cited as "D".] Avicenna's fullest treatment of logic is to be found in his massive treatise *Al-Shifa'* whose logical sections are now appearing in print in Cairo under the auspices of the Egyptian Ministry of Education. The section of this work relevant to the present chapter (No. IV on syllogistics, al-Qiyas) has not appeared. Until it is available, the present discussion must be viewed as tentative.

In a work entitled *L'Organon d'Aristote dans le Monde Arabe* (Paris, 1934), Ibrahim Madkour has made an extensive study of the *Isharat*. (The section of this work which will concern us here is treated on pp. 159–172.) Valuable though it is, Madkour's discussion is not always to be trusted on points of logic, and indeed sometimes puts Avicenna into errors which he himself avoided.

this number is even, or it is odd" (I, 117–118; cf. D, 36). Thus "conditional" propositions are *compounds* of "attributive" proposition, the compound statement being such as not to assert its components, but to relate them.

Avicenna considers two main types of "conditional" propositions: "conjunctive" (*muttasilah*) and "disjunctive" (*munfasilah*). The "conjunctive conditional" propositions correspond to *hypothetical* statements. The paradigm examples are "If the sun has risen, it is day," and "If the sun has risen, it is not night" (I, 117–118; D, 41–42). The "disjunctive conditional" propositions correspond to *disjunctive* statements (in the sense of exclusive disjunction).[2] The paradigm examples are "Either this number is even, or it is odd" and "Either this number is even, or it is not divisible into two even parts" (I, 118; D, 41–42).[3]

Avicenna's distinctions correspond exactly with those found in Boethius' treatise *De Syllogismo Hypothetico*,[4] which subsequently became established in Western logic.[5] (Since Latin writings were not available to the Arabs, this may be taken as further evidence in support of the general supposition that the pivotal ideas of Boethius' work derive from Greek sources).[6] This correspondence may be indicated as follows:

[2] The exclusive character of disjunction is quite clear throughout Avicenna's discussion. For example: "The assertion of a disjunctive proposition consists in asserting an incompatibility—as when one says: 'It is either thus, or it is so'." (D, 44). Sometimes, however, Avicenna's examples of disjunctions would be compatible with an inclusive construction of "either . . . or."

[3] For fuller information regarding Avicenna's classification of propositions, and for his terminology, see A. M. Goichon, *Lexique de la Langue Philosophique d'Ibn Sīna* (Paris, 1938), pp. 305–318. That the distinctions just explained became part of the standard machinery of Arabic logic is shown by their inclusion in al-Abharī's popular tract "Introduction to Logic" (*Isaghūjī fī-'l-Manṭiq*). See E. E. Calverly's translation in the *D.B. MacDonald Memorial Volume* (Princeton, 1933), pp. 75–85 (see pp. 80–81).

[4] Migne, *Patrologia Series Latina*, vol. 64 (= *Boetii Opera Omnia*, v. II), pp. 831–876, see pp. 832–834. For two other points of agreement between Boethius and Avicenna regarding logical matters see S. M. Afnan, *Avicenna* (London, 1958), p. 84 and p. 97.

[5] See H. W. B. Joseph, *An Introduction to Logic* (2nd. ed., Oxford, 1916), p. 348, n. 1. Cf. Sir William Hamilton's *Lectures on Logic*, lecture XIII. Mlle Goichon believes that Avicenna's "conditional" propositions constitute "une sorte de proposition qui ne presente pas une correspondence exacte avec celle que l'on etudie en logique occidentale," and conjectures that Avicenna derived this concept from Oriental sources (I, 115, footnote 1). But this view is unwarranted, because every detail of Avicenna's characterization of "conditional" propositions corresponds precisely to Boethius' treatment of the category of "hypothetical" propositions. In general, however, Miss Goichon clearly and rightly stresses Avicenna's indebtedness in the analysis to Stoic sources (I, 57 and 67).

[6] Regarding the occurrence of these distinctions in Chrysippus, see von Arnim, *Stoicorum Veterum Fragmenta* (Leipzig, 1903), vol. II, p. 68; as cited by S. M. Afnan, *Avicenna* (London, 1958), p. 196, and cf. also pp. 86–87. A discussion of the sources of Boethius is found in K. Dürr, *The Propositional Logic of Boethius* (Amsterdam, 1951), pp. 4–15. The distinctions in question apparently go back to the earlier peripatetics, Theophrastus and Eudemus in particular, and were taken up by the Stoics.

"Modern" Terminology	*Boethius' Terminology*	*Avicenna's Terminology*
I. Categorical Propositions	I. Categorical Propositions	I. Attributive Propositions
II. Non-Categorical Propositions	II. Hypothetical Propositions	II. Conditional Propositions
1. Hypothetical	1. Conjunctive	1. Conjunctive
2. Disjunctive	2. Disjunctive	2. Disjunctive

Thus, for Avicenna, a "conditional" proposition may take either of the forms:

(i) "Conjunctive" case: If A, then C.
(ii) "Disjunctive" case: Either A, or C.

In both cases, a "conditional" proposition has two constituents, of which the former (i.e., A) is characterized as *antecedent* (*muqaddim*), and the latter (i.e., C) as *consequent* (*tali*) [I, 117; D, 41]. Avicenna applies this terminology in the "disjunctive" as well as in the "conjunctive" case. When a "disjunctive conditional" proposition takes the form "Either A, or C_1, or C_2," *both* C_1 and C_2 are characterized as consequents (D, 41–42). Avicenna also recognizes such complex "conditional propositions" as "If A, then either C_1 or C_2," and "Either if A then C_1 or it is not the case that if A then C_2" (I, 129–130).

III. *The Quality of "Conditional" Propositions*

According to Avicenna, "conditional" propositions can be either affirmative or negative. His paradigm examples of negative "conditionals" are: "Not: if the sun has risen, it is night," and "Not: either this number is even, or it is divisible into two equal parts" (I, 118; D, 43–44). He is explicit in emphasizing that the quality of a "conditional" proposition has nothing to do with the affirmativeness or negativity of its constituents, but depends solely upon whether the liaison or relationship between them is affirmed or denied (I, 118; cf. D, 43).

With respect to the quality of "conditional" propositions, Avicenna thus presents the following classification:

Mode of "Conditional"	Affiirmative Form	Negative Form
"Conjunctive"	If A, then C.	Not: if A, then C.
"Disjunctive"	Either A, or C.	Not: either A, or C.

Avicenna apparently takes no account of the fact that there is no way in which a proposition of the form "Not: if A, then C" can be trans-

formed into the "conjunctive conditional" paradigm "If X, then U."[7] Nor can "Not: either A or C" (in Avicenna's exclusive sense of "either . . . or") be put into the form "Either X, or Y." Avicenna fails to note that in introducing the negative forms of "conditional" propositions in the way he does, he has, in effect, *broadened* the categories of "conjunctive" and "disjunctive" propositions beyond their original characterization.[8]

IV. *The Quantity of "Conjunctive Conditional" Propositions*

As a result of the work of Benson Mates, it is well-known that the Megarian logician Diodorus Cronus introduced a mode of implication characterized by the principle that "If A, then C" is to amount to:

At each and every time t: If A-at-t, then C-at-t.

Following Mates, we may symbolize this *Diodorean implication* in modern notation as: $(t)(A_t \supset C_t)$[9] Diodorus' paradigm example of a true implication statement is "If it is day, then it is light," and of a false one, "If it is day, then I am conversing."[10]

The Diodorean conception of implication remained a living idea among the Stoic logicians.[11] It is well-known that the Arabic philosophers drew extensively on the work of the Stoics.[12] Thus it was that Avicenna found that Diodorean implication afforded a ready-made instrument for the quantification of "conditional" propositions.

[7] In consequence of this, Western logicians did not divide the class of hypotheticals into the subdivisions of affirmative and negative. (See for example, J. Gredt, *Elementa Philosophiae Aristotelico-Thomisticae* (Barcelona, 1946) I, pp. 37–40.

[8] Rather than taking this omission to represent a mere oversight on Avicenna's part, I believe it to be an (added) indication that Avicenna's logic draws upon sources in which the Stoic distinction between *denial* (*arnetikon*) and *negation* (*apophatikon*) is made. (See B. Mates, *Stoic Logic* [University of California Publications in Philosophy, vol. 26 (1953)], p. 31). If we start with discussions in which this distinction is presupposed, but assume it to be blurred in translation or exegesis, Avicenna's remarks are a natural consequence.

[9] Benson Mates, "Diodorean Implication," *The Philosophical Review*, vol. 58 (1949), pp. 234–242; see especially p. 238. Cf. also Martha Hurst, "Implication in the Fourth Century B.C.," *Mind*, vol. 44 (1935), pp. 485–495; and Mates' *Stoic Logic*.

[10] In the case of atemporal subject-matter, it would seem natural to substitute "case-in-which" for "time-at-which" phraseology, for example in a Diodorean-type rendering of the conditional "If a number is prime, it cannot be divided by four." Our very scanty sources regarding Diodorus however give no indication that he applied his analysis to atemporal cases.

[11] See Mates' discussion, *op. cit.*, p. 234. Sextus Empiricus quotes the remark of Callimachus that "Even the crows on the roof-tops are cawing about which conditionals are true" (*Adv. Math.* (Loeb), I, 309).

[12] See S. Horowitz's classic study, "Ueber den Einfluss des Stoicismus auf die Entwicklung der Philosophie bei den Arabern," *Zeitschrift der Deutschen Morgenländischen Gesellschaft*, vol. 57 (1903), pp. 177 ff.

Avicenna teaches that an affirmative "conjunctive conditional" proposition "If A, then C" may take the universal form,

(i) Always [i.e., "at all times"[13] or "in all cases"]: when A, then (also) C;

or the particular form,

(ii) Sometimes: when A, then (also) C.[14]

Correspondingly, the negative "conjunctive conditional" propositions can take the universal form,

(iii) Never: when A, then (also) C;

and the particular form,

(iv) Sometimes not: when A, then (also) C.[15]

Avicenna's discussion and his illustrative examples make it clear that what he has in mind is most simply and accurately described in terms of the table:

Cases in which	C holds	C does not hold
A holds	I	II
A does not hold	III	IV

Here the universal affirmative (i) corresponds to the condition that compartment II is empty. (Note that this accounts for the terminology of "conjunctive" for hypotheticals—if II is empty, then C is always "conjoined" with A.) The particular affirmative (ii) corresponds to the circumstance that compartment I is non-empty (i.e., A and C are sometimes "conjoined"). Analogously, the universal negative (iii) corresponds to the circumstance that compartment I is empty, and the particular negative (iv) to the circumstance that compartment II is non-empty.

As the exposition of Avicenna's discussion shows, his treatment of "conditional conjunctive" propositions is in effect a generalization upon the Diodorean analysis of implication. The single universal affirmative mode of Diodorean implication is expanded into a full-scale treatment of this implication relationship, fully articulated with respect both to quantity and to quality.

Thus we may summarize:

[13] Regarding Avicenna's emphasis upon this temporal construction see Miss Goichon's comment, I, p. 157, n.b.l.

[14] See I, 123; D, 43–44.

[15] See I, 123–124; D, 43–44.

Avicenna's Classification of Conjunctive Conditional Propositions

Form	Symbolic Rendition	Avicenna's Illustrative Paradigm
A (U.A.)	$\left.\begin{array}{l}(t)(A_t \supset C_t)\\ (t)\sim(A_t \,\&\, \sim C_t)\end{array}\right\}$	"Always: when the sun has risen, it is day." (I, 123; D, 43–44)
E (U.N.)	$(t)\sim(A_t \,\&\, C_t)$	"Never: when the sun has risen, it is night." (I, 123; D, 44)
I (P.A.)	$(\exists t)(A_t \,\&\, C_t)$	"Sometimes: when the sun has risen, it is cloudy." (I, 123; D, 44)
O (P.N.)[16]	$(\exists t)(A_t \,\&\, \sim C_t)$	"Sometimes not: when the sun has risen, it is cloudy." (I, 123–24; D, 44)

V. *The Quantity of "Disjunctive Conditional" Propositions*

In quantifying "conjunctive conditional" propositions, Avicenna, as we have seen, follows in the footsteps of the Stoics, carrying to their "logical conclusion" suggestions inherent in the Diodorean concept of implication. In the analogous quantification of "disjunctive conditional" propositions, Avicenna's discussion takes yet another step beyond Stoic logic as we presently conceive it.

In the quantification of "disjunctive conditional" propositions of the form "Either A, or C," Avicenna proceeds by close analogy with his Diodorean-style quantification of implication-statements of the form "If A, then C." Thus Avicenna holds that an affirmative "disjunctive conditional" statement may take either the universal form,

(i) Always [i.e., "at all times" or "in all cases"]: either A, or C;

or the particular form,

(ii) Sometimes [i.e., "at certain times" or "in certain cases"]: either A, or C.[17]

Correspondingly, the negative "conjunctive conditional" propositions can take either the universal form,

(iii) Never [i.e., "at no times" or "in no cases"]: either A, or C;

or the particular form,

(iv) Sometimes [i.e., "at certain times" or "in certain cases"] not: either A, or C.

Again, the exact construction Avicenna places upon these propositions is best described in terms of the table:

[16] In Avicenna's discussion, following Aristotle (*Anal. Pr.*, 24a18–22), propositions of "indeterminate" quantity are also treated. A proposition is of indeterminate quantity when, like "Man is a writer," its quantity is indefinite, being wholly equivocal as between "All men are writers" and "Some men are writers" (I, 123–124; D, 44).

[17] See I, 123–124; D, 43–44.

Cases in which	C holds	C does not hold
A holds	I	II
A does not hold	III	IV

The universal affirmative proposition (i) corresponds to the condition that compartments I and IV are both empty; and the particular affirmative (ii) corresponds to the circumstance that at least one of the compartments II and III is non-empty. Analogously, the universal negative (iii) corresponds to the circumstance that compartments II and III are both empty (i.e., A and C always either occur conjointly or are absent conjointly), while the particular negative (iv) corresponds to the circumstance in which at least one of the compartments I and IV are non-empty.

Thus we may summarize:

Avicenna's Classification of "Disjunctive Conditional" Propositions

Form	Symbolic Rendition[18]	Avicenna's Illustrative Paradigm
A (U.A.)	$(t)(A_t \vee C_t)$	"Always: either a number is even, or it is odd." (I, 123; cf. D, 44)
E (U.N.)	$(t)\sim(A_t \vee C_t)$	"Never: either the sun has risen, or it is day." (I, 123; cf. D, 44)
I (P.A.)	$(\exists t)(A_t \vee C_t)$	"Sometimes: either Zaid is in the house, or Amr is there." (I, 123; cf. D, 44)
O (P.N.)	$(\exists t)\sim(A_t \vee C_t)$	"Sometimes not: either a fever is 'bilious', or it is 'sanguine'." (I, 123–124; cf. D, 44)

We thus find that Avicenna's discussion carries over to disjunctive propositions the Diodorean-style quantification which it proved for hypothetical propositions. It is possible that this might be found already in his Arabic predecessors,[19] or in some late Greek commentary on

[18] The upper case vee "V" is here used to symbolize exclusive disjunction, following Bochenski's usage in his discussion of Boethius in *Ancient Formal Logic* (Amsterdam, 1951), p. 107.

[19] We know that al-Farabī (*c.* 870–950) wrote on hypothetical propositions and inferences. (See C. Prantl, *Geschichte de Logik im Abendlande*, vol. II, pp. 317–318.) We know too that al-Farabī's teacher, Abu Bishr Matta ibn Yunus (*c.* 860–940) wrote a treatise on hypothetical syllogisms. (See M. Steinschneider, "Die Arabischen Uebersetzungen aus dem Griechischen," *Zwolftes Beiheft zum Centralblatt fur Bibliothekswesen* [Leipzig, 1893], p. 43.) Unfortunately, however, neither of these works has survived. Furthermore, al-Kindī (*c.* 800–873) is known to have been partial to hypothetical and disjunctive syllogisms. (See R. Walzer, "New Light on the Arabic Translations of

Aristotle's logic written under Stoic influences.[20] But so far as I have been able to determine, Avicenna is the first writer in the history of logic to give an analysis of hypothetical and disjunctive propositions that is fully articulated with respect to quality and to quantity.

VI. *The Theory of Immediate Inference for "Conditional" Propositions*

In the treatise under consideration, Avicenna dispatches the question of the theory of immediate inference for "conditional" propositions in one brief remark. He observes that, in the two cases of *contradiction* and of *conversion* the same rules apply which govern the "attributive," i.e., categorical, propositions, the antecedent playing the role of subject, and the consequent that of predicate (I, 131). The extent to which this remark is correct may be seen in the following tabulation:

Mode of Categorical Inference[21]	*Status of "Conjunctive Conditional" Analogue*	*Status of "Disjunctive Conditional" Analogue*
Contradiction		
1. Of *A* and *O*	holds	holds
2. Of *E* and *I*	holds	holds
Conversion		
1. Of *A* (invalid)	fails	holds*
2. Of *E* (valid)	holds	holds
3. Of *I* (valid)	holds	holds
4. Of *O* (invalid)	fails	holds*

It is clear that Avicenna's statement is correct only with the exception of the two starred cases. But Avicenna is perfectly aware of this unorthodox feature of "disjunctive conditional" propositions, and himself comments upon it with admirable explicitness.[22] It seems necessary therefore to regard Avicenna's above-cited statement as an incautious formulation. What he should have said is that, with regard both to contradiction and conversion, all of the categorically valid inferences are also valid for "conditional" propositions, though the converse of this rule holds only in the case of "conjunctive conditional" propositions.

With regard to other kinds of immediate inference, it is clear that

Aristotle," *Oriens*, vol. 6 (1953), p. 129.) However al-Farabī's *Short Commentary on Aristotle's "Prior Analytics"* (tr. N. Rescher; Pittsburgh, 1963) contains a short section on conditional syllogisms (pp. 74–80 of the translation) which in large measure agrees, so far as it goes, with Avicenna's treatment.

[20] The concepts of Stoic logic penetrated into the other schools of Greek philosophy. See, for example, H. Matte in *Gnomon*, vol. 23 (1951), p. 35.

[21] It is assumed throughout that the requirement of existential import is satisfied.

[22] See D, 42–43, where Avicenna discusses the greater amenability to conversion of "disjunctive conditional" propositions *vis à vis* the "disjunctive conditional" ones.

subalternation (*A* to *I*, *E* to *O*), contrariety of (of *A* and *E*) and subcontrariety (of *I* and *O*) also hold with respect both to "conjunctive conditional" and to "disjunctive conditional" propositions.

VII. *Another Treatment of the Quality and Quantity of Hypothetical and Disjunctive Properties*

To have a standard of comparison for assessing the treatment of the logic of "conditional" propositions to be found in Avicenna, it is useful briefly to examine the discussion of hypothetical and disjunctive propositions in a modern logic-manual written in the Western "Aristotelian" tradition. For this purpose, I have chosen J. Welton's comprehensive *Manual of Logic* (vol. I, 2nd. ed., London, 1896; cited henceforth as "ML").

The paradigm of a hypothetical proposition is taken as "If M, then P" (p. 181). Here M and P are understood to be strictly subject-predicate propositions, of the type "S is an M" and "S is a P," respectively. A hypothetical proposition is negative when its *consequent* is negated, so that the paradigm of a negative hypothetical is "If M, then not P." (It is thus recognized that the *denial* of a hypothetical is not itself of hypothetical form—a result that Avicenna apparently viewed with distaste.) The quantity of a hypothetical proposition is fixed by prefixing "always" for universals, and "sometimes" for particulars (p. 186). The four resulting modes are characterized as:[23]

Mode	Formulation	Interpretation
A (U.A.)	Always, if M, then P.	$(s)(M_s \supset P_s)$
E (U.N.)	Always, if M, then not P. Never, if M, then P.	$(s)(M_s \supset \sim P_s)$ $(s)\sim(M_s \,\&\, P_s)$
I (P.A.)	Sometimes, when M, then P.	$(\exists s)(M_s \,\&\, P_s)$
O (P.N.)	Sometimes, when M, then not P.	$(\exists s)(M_s \,\&\, \sim P_s)$

It is readily seen that, from a *strictly formal* standpoint, this analysis is entirely equivalent with that presented by Avicenna. A great difference, however, lies in the *semantical interpretation* of hypotheticals in the two treatments. For Avicenna, the U.A. proposition "If A, then C" is construed as: "In every *case in which* A holds true, so also does C." For Welton, on the other hand, "If M, then P" is to be construed as "For every *individual for which* M holds true, so also does P." Avicenna thus construes hypotheticals after the Stoic "case-in-which-true" manner, while Welton adheres to the "thing-for-which-true" construction of subject-predicate logic.

With respect to the theory of immediate inference for hypotheticals,

[23] ML, 244; see also p. 271.

Welton states that, on the analysis just given, "the whole doctrine of opposition is applicable" (ML, 244), and proceeds to show this in a detailed way.[24] In view of the formal equivalence just remarked upon, the Avicenna can, of course, make the same claim.

With regard to *disjunctive* propositions, one fundamental point of difference lies in the fact that Welton construes disjunction in terms of its *inclusive* applications (ML, 188–189). He proceeds to recognize four modes of disjunctive propositions:[25]

Mode	Formulation	Interpretation
A (U.A.)	All S's are either P's or Q's	$(s)(P_s \vee Q_s)$
E (U.N.)	No S's are either P's or Q's	$(s)\sim(P_s \vee Q_s)$
I (P.A.)	Some S's are either P's or Q's	$(\exists s)(P_s \vee Q_s)$
O (P.N.)	Some S's are neither P's nor Q's	$(\exists s)(\sim P_s \,\&\sim Q_s)$ $(\exists s)\sim(P_s \vee Q_s)$

We may observe that, aside from the different (i.e., inclusive) construction of the disjunction relation "either . . . or," there is a substantial formal analogy between the four modes of Welton's treatment and those of Avicenna's discussion. However, there is again a vast difference in the meaning which these two analyses accord to disjunction-statements. In Welton, the discussion is rigidly restricted to the confines of subject-predicate logic. In Avicenna we have the Stoic-Megaric notion of quantifying over "cases in which X holds." In Welton's analysis, on the other hand, we have only the orthodox "Aristotelian" notion of quantifying over "things to which X applies."

As regards the theory of immediate inference for disjunctive propositions, Welton explicitly recognizes that "the full doctrine of opposition cannot be applicable" (ML, 246). He is quite clear as to the modifications that are required.[26]

VII. *Conclusion*

We have seen that a fully articulated theory of the logic of hypothetical and disjunctive propositions is apparently first to be found in the logical treatises of Avicenna. This theory may possibly be a product of late Greek rather than of originally Arabian logic, being a natural extension of ideas inherent in Stoic logic. At any rate, Avicenna is the earliest logician in whose writings this theory has thus far been identified.

As a comparison with the approach of "Aristotelian" logicians in the

[24] See ML, 244–246.
[25] ML, 192; see also p. 246.
[26] See ML, 274.

Latin West emphasizes, Avicenna's quantification of hypothetical and disjunctive propositions proceeds in truth-condition terms, rather than in the subject-predicate terms of the analysis given by European logicians. This difference of approach is clearly traceable to Stoic influences. Avicenna's treatment of "conditional" propositions thus affords a striking illustration of the fact that in Arabic logic, Stoic ideas were yet alive which did not figure in the more orthodox Aristotelianism which developed among the Latins.

IX

ABŪ-'L-ṢALT OF DENIA ON MODAL SYLLOGISMS

Abu-'l-Ṣalt Umaiyah ibn Abī-'l-Ṣalt ibn 'Abd-al-'Azīz al-Andalusī, one of the series of important scholar-scientists produced by Muslim Spain in the 12th century A.D., was born in Denia in 1068. In 1095, after completing his scholarly and medical studies, he removed from Seville to Alexandria, and thence later to Cairo, where he won favor at court. In connection with an unsuccessful attempt to raise a sunken ship, Abū-'l-Ṣalt was disgraced and imprisoned for some years. After his release in 1111, he went to Tunis, where he died in 1134.

Abū-'l-Ṣalt wrote scholarly treatises in various fields, including medicine, astronomy, logic, philology, and literature (he even wrote poetry).[1] The book of his which concerns us here is perhaps his most important, and certainly his best-known work. It is the *Kitab al-taqwīm al-dhihn* ("Book on the Improvement of the Mind"), a treatise on logic edited in 1915 by the eminent Spanish Arabist Ángel Gonzalez Palencia under the title: *Abusalt-Rectificación de la Mente: Tratado de Lógica* (Madrid, Centro de Estudios Historicos, 1915). In addition to editing Abū-'l-Ṣalt's treatise, Gonzalez provides a Spanish translation, and a long and informative introduction which will long remain one of the principal references regarding this author.

Although he is not to be regarded as primarily a logician, Abū-'l-Ṣalt fills a significant gap in our understanding of the tradition of logical studies in Muslim Spain. A generation or so later than Ibn Ḥazm of Cordova (994–1064) and al-Darimī (*c.* 1010–1070) he was of an earlier generation than his more illustrious countrymen Ibn Bajjah (Avenpace, *c.* 1090–1138), Ibn Zuhr (Avenzoar, *c.* 1100–1162), and Ibn Rushd (Averroes, 1126–1198). Abū-'l-Ṣalt thus represents an important link in our knowledge of the medico-philosophical tradition of al-Andalus.

In his logic-treatise Abū-'l-Ṣalt bears witness to a phenomenon which is as yet quite imperfectly understood—the continuing influence of al-Farabī upon the logicians of Muslim Spain, long after his influence was virtually extinct in the Islamic East. On the basis of the admittedly

[1] For a concise account of this literary output, as well as references to the materials on Abu-'l-Ṣalt in the Arabic bio-bibliographical literature, see Brockelmann, *Geschichte der Arabischen Litteratur*, vol. I, pp. 486–487 and *Supplementband* I, p. 889.

scanty data at our disposal we would conjecture that the logic-treatise of Abū-'l-Salt—which, as we shall see, mirrors the authentic doctrines of *Prior Analytics* with great faithfulness—will in the event prove to have few if any genuinely original elements, and to be drawn in large measure from the works of the great Aristotelian of Baghdad. In particular, the elaborate treatment of modal syllogisms to be found in Abu-'l-Salt's book—to my knowledge more detailed than that of any other pre-Averroist Arabic logical treatise now (1962) in print—will, we feel sure, turn out to have been extracted from al-Farabī's commentaries on Aristotle's treatise.[2]

The table given on the opposite page reproduces in summary form the tabulations of valid modal syllogisms given by Abu-'l-Salt. This chart is reasonably self-explanatory. For the advantages of comparison, the reader should consult the corresponding tabulation given by W. D. Ross opposite page 286 of his edition of Aristotle's *Prior and Posterior Analytics* (Oxford, 1957, second edition). The principal points to emerge from a careful comparison of Aristotle's original treatment of the modal syllogisms with that of Abū-'l-Salt are as follows:

(1) The six cases treated by Abū-'l-Salt correspond exactly to six cases treated by Aristotle, viz. columns 1, 3, 4, 5, 6 and 7 in the tabulation of Ross. The cases omitted by Abu-'l-Ṣalt, namely Ross-Aristotle columns 2, 8, and 9, can be subordinated to the included cases by a simple *a fortiori* argument (viz. to columns 3, 6, and 7 respectively). Abū-'l-Salt takes explicit note of their assimilation (see p. 118 of the translation of the text).

(2) Except for those few points to be noted explicitly in the sequel, Abū-'l-Salt's treatment of the modal syllogisms is in complete and entire agreement with that of Aristotle.[3]

(3) Abū-'l-Salt introduces first-figure perfect syllogisms (i.e., those needing no derivative justification) only where this is done by Aristotle, and in all of these cases except for those omitted as being justifiable by *a fortiori* arguments (see point 1 above).

(4) In a few cases (specifically I–8, II–8, and III–8; and I–13, II–13, and III–13) Abū-'l-Salt replaces an Aristotelian justification by

[2] Al-Farabī's short commentary (epitome) does not deal with modal syllogisms, but this is certainly not the case with his (as yet unrecovered) great and middle commentaries on *Anal. Pr.* See N. Rescher, *Al-Farabī's Short Commentary on Aristotle's "Prior Analytics"* (Pittsburgh, 1963).

[3] Regarding the conceptual foundations of Aristotle's theory of modal syllogistic see N. Rescher, "Aristotle's Theory of Modal Syllogisms and its Interpretation" in *The Critical Approach: Essays in Honor of Karl Popper*, ed. Mario Bunge (The Free Press of Glencoe, 1964).

ABŪ-'L-ṢALT'S TABULATION OF VALID MODAL SYLLOGISMS
(The Table Gives the Modality of the Conclusion of a Valid Modal Syllogism)

	I Major – A Minor – A	II Major – N Minor – A	III Major – A Minor – N	IV Major – C Minor – C	V Major – C Minor – A	VI Major – A Minor – C
Figure 1						
(1) AAA	A (PS)	N (PS)	A (PS)	C (PS)	C (PS)	C (R)
(2) EAE	A (PS)	N (PS)	A (PS)	C (PS)	C (PS)	P**(R)
(3) AII	A (PS)	N (PS)	A (PS)	C (PS)	C (PS)	C (R)
(4) EIO	A (PS)	N (PS)	A (PS)	C (PS)	C (PS)	P**(R)
	Pp. 87–89	Pp. 95–97	Pp. 95–97	Pp. 102–104*	Pp. 105–107	Pp. 105–107*
Figure 2						
(5) EAE	A(C to I–2)	N(C to II–2)	A(C to III–2)	—	—	P**(C to VI–2)
(6) AEE	A(C to I–2)	A(C to III–2)	N(C to II–2)	—	P**(C to VI–2)	—
(7) EIO	A(C to I–4)	N(C to II–4)	A(C to III–4)	—	—	P**(C to VI–4)
(8) AOO	A(E & C)	A(E & C)	A(E & C)	—	—	—
	Pp. 90–92	Pp. 98–99	Pp. 98–99		Pp. 108–110*	Pp. 108–110*
Figure 3						
(9) AAI	A(C to I-3)	N(C to II–3)	N(C to II–3)	C(C to IV–3)	C(C to V-3)	C(C to VI–3)
(10) EAO	A(C to I-4)	N(C to II–4)	A(C to III–4)	C(C to IV–4)	C(C to V-4)	P**(C to VI–4)
(11) IAI	A(C to I-3)	A(C to III–3)	N(C to II-3)	C(C to IV–3)	C(C to VI–3)	C(C to V–3)
(12) AII	A(C to I-3)	N(C to II-3)	A(C to III–3)	C(C to IV–3)	C(C to V-3)	C(C to VI-3)
(13) OAO	A(E & C)	A(E & C)	A(E & C)	C(R)	C(R)	C(R)
(14) EIO	A(C to I-4)	N(C to II-4)	A(C to III–4)	C(C to IV–4)	C(C to V–4)	P**(C to VI–4)
	Pp. 92-95	Pp. 100-102	Pp. 100-102	Pp. 111–113*	Pp 114–117	Pp. 114–117*

Note: The page citations give the relevant references to the translation by González Palencia of Abū-'l-Ṣalt's text.

KEY

Modalities: A = assertoric or absolute
N = necessary or apodictic
C = contingent or problematic (neither necessary nor impossible)
P = possible (not impossible)

Justifications: PS = perfect syllogism (no justification required)
C = conversion
E = ecthesis
R = reductio

* In addition to the indicated cases, Abū-'l-Ṣalt—like Aristotle himself—lists a corresponding number of others that can be validated by the complimentary conversion of contingent premisses

** The Spanish translation is erroneous at these places. See footnote 6 below.

reductio by a justification by ecthesis. This substitution goes back in the Arabic tradition at least to al-Fārābī.[4]

(5) In one case, namely VI–13, Abū-'l-Ṣalt recognizes a valid modal syllogism where Aristotle does not.[5]

(6) In a few cases, Abū-'l-Ṣalt does not exercise sufficient care in maintaining Aristotle's distinction between the possible (*to dynaton*) and the contingent (*to endechomenon*; that which is neither necessary nor impossible). For example in cases V–11, and V–13, as well as VI–1, VI–3, VI–9, and VI–12 (and in the corresponding cases arising from complimentary conversion of contingent propositions) the appropriate entry is P and *not* C.[6] (Because of the reduction-justification procedures, it can be seen that the error ultimately traces to cases VI–1 and VI–3.)

On balance, then, it can be seen that, aside from one or two minor points of detail, Abū-'l-Ṣalt's theory of modal syllogisms mirrors closely and faithfully the position originally established by Aristotle in *Prior Analytics*. In Abū-'l-Ṣalt's treatise we can see at work the painstakingly faithful Aristotelianism of the logicians of Muslim Spain, a faithfulness that finds its most notable expression in Abū-'l-Ṣalt's greatly more distinguished successor, Averroes.

As we have stated, and have supported in greater detail elsewhere,[7] this phenomenon is due to the powerful and continued influence of al-Fārābī upon the logico-medico-philosophical tradition of Muslim Spain.[8, 9]

[4] See N. Rescher, *Al-Farabi's Short Commentary on Aristotle's "Prior Analytics"*, p. 42.

[5] González' translation (p. 115) mistakenly speaks of a *particular* minor in this case (his number 14).

[6] On pp. 105–107 (37–38 of the Arabic text) the confusions attributable to Abu-'l-Salt are compounded by the translator's rendering of *bi-'l-idkirar* as "not necessarily" instead of "possibly" (this affects cases VI-2, VI-4 and puts the discussion on pp. 105–106 out of joint with its summary on p. 107); and on pp. 108–117 (39–45 of the Arabic text) reading *la* (instead of *ma*) *min al-idkirar*, i.e., "not possibly" instead of "possibly" (this affects cases V-6, VI-5 and VI-7). A corresponding error on pp. 114–117 (43–45 of the Arabic text) affects cases VI-10 and VI-14.

[7] N. Rescher, *The Development of Arabic Logic*, Pittsburgh (University of Pittsburgh Press), 1964.

[8] When Maimonides made his well-known statement that logic was to be studied only from the books of al-Farabī (which was to cause the transmission of those works to the medieval Jews and their great influence among them) he was not voicing a personal judgment, but reflecting the tradition in which he had been trained.

[9] The author wishes to acknowledge the assistance of his student, Mr. Richard K. Martin, in compiling and checking some of the data presented above.

X

AVERROES' *QUAESITUM* ON ASSERTORIC (ABSOLUTE) PROPOSITIONS

I. *Introduction*

Until 1962 only one logical work of Averroes existed in print in the original Arabic.[1] At this late date, D. M. Dunlop published the Arabic text of the short tract by Averroes on the modality of propositions, with which we shall be concerned here.[2]

The text published by Professor Dunlop forms part of a collection of treatises by Averroes which has long been known to exist in the immensely valuable collection of Arabic manuscripts of the Escorial Library, near Madrid.[3] The collection is simply entitled *Masā'il* (Questions),[4] faithfully reflected in the rubric of *Quaesita* under which several of these treatises are given in Latin versions in the 16th century editions of *Aristotelis Opera cum Averrois Commentariis.*

The particular treatise published by Prof. Dunlop deals with the problem of the relationship of assertoric propositions to the modalities of possibility and necessity. This treatise has been accessible for over four centuries in two printed Latin versions, made in Renaissance times from medieval Hebrew translations. The earlier of the Latin versions was made by a Jewish scholar, Elia del Medigo, for the Renaissance luminary Giovanni Pico della Mirandola, and was printed in the very rare Aldine incunabulum edition of the *Quaesita Averrois in librum priorum* (*analytiorum Aristotelis*) (Venice, 1497). A second Latin translation was made by Abraham de Balmes (d. 1523),[5] and printed in

[1] Maurice Bouyges (editor), Averroes: *Talkhīṣ Kitāb al-Maqoulāt* ["Middle Commentary on Aristotle's *Categoriae*"] Beyrouth, 1932 (= vol. IV of Bibliotheca Arabica-Scholasticorum, Serie Arabe).

[2] D. M. Dunlop, "Averroes (Ibn Rushd) on the Modality of Propositions," *Islamic Studies* (Journal of the Central Institute of Islamic Research, Karachi), vol. 1 (1962), pp. 23–34.

[3] Michael Casiri, *Bibliotheca Arabico-Hispana Escurialensis* (2 vols., Madrid; 1760, 1770), no. 629; Hartwig Derenbourg, *Les Manuscrits Arabes de l'Escurial* (3 vols., Paris; 1884, 1903, 1928), no. 632.

[4] Prof. Dunlop states that "another copy" of the *Masa'il* (presumably made from the Escorial MS?) exists in the Biblioteca Nacional in Madrid (No. 102 in the catalog of Robles).

[5] For information about this translator see Bayle's *Dictionary*, art. "BALMIS, Abraham de," where note (B) describes some complaints about his translations from Hebrew to Latin. (I owe this reference to Prof. Richard Popkin.) Note (I) of Bayle's article on "AVERROES" gives some data concerning the Renaissance translations of

several of editions of the Juntine Latin Aristotle (Venice, from 1590).[6] From these versions the main substance, at any rate, of Averroes' *Quaesitum* has been determinable.[7]

The present, reasonably literal translation of the Arabic text should facilitate the work of anyone wishing to form his own judgment about the character of the Latin versions of Averroes' logical treatises, or at any rate the not insignificant number of them that came from the pen of Abraham de Balmes. The Latin version in the present instance is, on the whole, literal to the point of obscurity. It is punctuated by occasional strange, and sometimes ludicrous renderings—as, for example, at 27:6, where "not used in the art of rhetoric" becomes *non uterent agricolae*! Occasionally the Latin encorporates a marginal explanation within the text (e.g. at 29:10), and sometimes it omits phrases of the Arabic text. In general, it is significantly more difficult to derive from the Latin than from the Arabic an exact idea just what it is that Averroes had in mind.

Unquestionably the most interesting aspect of Averroes' treatise is the light it sheds upon the efforts of the Greek and Arabic Aristotelians to come to terms with Aristotle's theory of modal propositions and modal syllogisms. As we know from the Greek commentators, already Aristotle's principal pupils, Theophrastus and Eudemus, differed with the teachings of the master on his head.[8] Since the reconstruction of Aristotle's theory of modal propositions and syllogisms has only begun to make substantial headway in the most recent times,[9] any additional data as to the views of the eminent Aristotelians of the past on this much-disputed subject must be welcomed.

Averroes, citing *inter alia* the opinion expressed by Keckermann in his *Praecognitis Logicis* (II, 2, nb. 32): "How much all Philosophy is indebted to Averroes, can then only be known, when God shall raise up a Genius, who will free our Latin Translations of him from the unintelligible Barbarisms everywhere to be met with, and render him in That Language, in a style, at least tolerable, and intelligible, for the Use of Students in Philosophy."

[6] *Aristotelis Opera cum Averrois Commentariis*, vol. I. The edition of 1562 is now readily accessible in a photoreprinting made in Frankfurt am Main in 1962, and contains the "Averrois varii generis quaesita in libros logicae Aristotelis, Abramo de Balmes interprete," pp. 75 *verso*–119 *verso*. Our *quaesitum* is number two of eight devoted to matters from *Prior Analytics* and is given on pp. 78 *recto*–80 *recto* under the rubric: "Quid sit propositio absoluta, id est de inesse." I henceforth cite *this* text as "the Latin" version.

[7] The preceding data are for the most part derived from Prof. Dunlop's introduction to his edition of our text.

[8] See I. M. Bochenski, *La Logique de Theophraste* (Fribourg en Suisse, 1947).

[9] For a comprehensive account taking cognizance of all recent contributions to this subject see Storrs McCall, *Aristotle's Modal Syllogisms* (Amsterdam, 1963). The present writer's views are given in his essay on "Aristotle's Theory of Modal Syllogisms and its Interpretation" in M. Bunge, ed., *The Critical Approach* (Essays in Honor of Karl Popper), Glencoe, Ill., 1964.

Averroes has (in Section 7 of the treatise) a rather complicated, but extremely interesting scheme for construing propositions of the form, "The S's are (actually, possibly, necessarily) P's," in the various modalities. His proposed constructions appear to be as follows:

I. *Necessity:* "The S's are *necessarily* P's"

All S's are (*always*) P's.

II. *Possibility:*[10] "The S's are *possibly* P's"

(i) *Non-temporal Construction*

Mostly-possible: Most S's are P's.
Equally-possible: Equally many S's are P's as not.
Leastly-possible: Some S's are P's, but fewer than not.

(ii) *Temporal Construction*

Mostly-possible: For the majority of times t: Some S-at-t is P-at-t.
Equally-possible: For as many times t as not: Some S-at-t is P-at-t.
Leastly-possible: For the minority of times t: Some S-at-t is P-at-t.

III. *Actuality* (i.e., the Assertoric Mode): "The S's are (*actually*) P's"

Mostly-assertoric: For the majority of times t: All S-at-t is P-at-t.
Equally-assertoric: For as many times t as not: All S-at-t is P-at-t.
Leastly-assertoric: For the minority of times t: All S-at-t is P-at-t.

The five senses of *necessity* attributed to Avicenna in Section 11 of the *Quaesitum* seem to be as follows. "All S is necessarily P" can bear the constructions:

(1) The S's exist always and have P at all times of their existence. ("The heavenly sphere has a circular movement.")

(2) The S's have P at all times of their existence, whenever they exist. ("All men are animals.")

(3) (A mixed case.)

(4) The S's have P at some times of their existence, whenever they exist. ("All men die.")

(5) (A mixed case.)

[10] Here, and below in the translation, "possible" is to be construed in the sense of *contingent possibility*, i.e., Aristotle's *endechomenon* rather than *dynaton*.

In (1), (2) and (4) here, temporal considerations enter in a different, and yet more complicated way.[10a]

As this complex scheme suggests, the leading idea of the construction of modal propositions along the line taken by Averroes is to consider them as complex categorical propositions *extensionally quantified with respect to time.*

This chronological approach to the logic of modality—derived by the Arabic logicians from the Hellenistic Aristotelians, and probably owing its origination to the early peripatetics and perhaps also to Stoic influences—seems to have been lost to the Latin Aristotelianism of the middle ages.[11] It has, however, reappeared in logical studies in recent years.[12]

II. *Translation of Averroes'* Quaesitum *on Assertoric (Absolute) Propositions*[13]

|26:3| The distinguished imam Abū-'l-Walīd ibn Rushd, may God bless him and be pleased with him in His kindness, said:

1. *Introduction*

|26:4| The aim of this discourse is to investigate the [type of] premiss called *assertoric* |5| or *absolute*—what it is and what is the teaching of Aristotle about this [matter]. For the commentators differ about this, |6| and we must say that two opinions have come down to us about this [subject] from the commentators through the account which we found in the book |7| of Themistius,[14] and the account reported by Abū Nasr [al-Farābī].[15]

[10a] A yet more elaborate scheme, certainly derived from Avicenna, is given in the *Risālah al-Shamsiyyah* of al-Qazwīnī al-Katibī (1220–*c.* 1280). See A. Sprenger (ed.), *A Dictionary of the Technical Terms used in the Sciences of the Musulmans*, Calcutta, 1862; "First Appendix" issued in 1862, pp. 19–20 of the English translation.

[11] Formal analogies between modal and temporal notions were however recognized by the Schoolmen. See, e.g. William of Ockham's *Summa Logicae* (ed. P. Boehner, N.Y., 1951 and 1954); III, 1 (chapters 17–19).

[12] A. N. Prior, *Time and Modality* (Oxford, 1957). Jaakko Hintikka, "Necessity, Universality, and Time in Aristotle," *Ajatus*, vol. 20 (1957), pp. 65–90.

[13] I wish to thank Mr. Seostoris Khalil for help in checking my translation, and am especially grateful to Professor D. M. Dunlop for going over the translation and eliminating various errors and infelicities.

[14] For a discussion of the present passage insofar as it relates to Themistius, based on the Latin version, see Valentin Rose, "Ueber eine angebliche Paraphrase des Themistius," *Hermes*, vol. 2 (1867), pp. 191–213 (see especially p. 208). As Rose observes, the work of Themistius' from which this extract is taken has not otherwise been recovered.

[15] See Moritz Steinschneider's monograph, *Al-Farabi (Alpharabius): Des Arabischen Philosophen Leben und Schriften* (Mémoires de l'Académie Imperiale des Sciences de St.-Petersbourg, série VII, vol. 13, no. 4) St.-Petersbourg, 1869, p. 41.

2. *Two Divergent Views*[16]

|26:7| One of them [i.e., of the different teachings] is the teaching of Theophrastus |8| and Eudemus and Themistius, and the second is the teaching of Alexander [of Aphrodisias],[17] and his successors |9| among the commentators, according to what [18] Themistius has related. As for the teaching of Theophrastus [and Eudemus], it is that an |10| absolute and assertoric premiss is one from which is abstracted [both] the modality of possibility and the modality of necessity, and does not |11| explicitly contain either one of them; [although] the matter itself must [in fact] be either necessary or possible.[19] Thus an assertoric premiss, |12| according to these people [i.e., Theophrastus and his followers], is a premiss that does not possess a modality [of possibility or necessity]: it is as though it [i.e., the assertoric mode] were a genus of the necessary |13| and the possible, since it is reckoned that one or another of these two modalities is added to it. This [i.e., whether an assertoric proposition is properly necessary or possible] is determined by |14| the subject-matter. |15| This [then] is the teaching of the ancient Peripatetics about the absolute [premiss].

As for Alexander[20] |16| and the later commentators[21]—they think the assertoric premiss is a possible premiss when it [i.e., the state of affairs asserted by the premiss] |17| exists in fact, I mean, when it is actually found that the predicate belongs to the subject, that is, at the |18| present time.[22]

|27:1| Every one of these men supposes that his view is the [authentic] teaching of Aristotle on this subject. |2| And each of the two camps brings supporting arguments both from the standpoint of the matter itself and also supporting arguments from the discussions |3| of Aristotle himself.

[16] It seems better, from the standpoint of the substance of the discussion, for the second section of the text to begin here rather than at 26:15 below, as the MS indicates.

[17] The Latin (mistakenly) reads: *sunt duae opiniones, quarum una est opinio Themistii, et Eudemii, et altera est opinio Theophrasti.*

[18] I suppose *fī-mā* for *fī-hā*.

[19] Note that this lays the basis for distinguishing between modality *de dicto* (relating to the modal status of a *statement*) and modality *de re* (relating to the modal status of the *fact* asserted by a statement).

[20] *Ad Anal. Pr.* I, 2.

[21] The Latin (appropriately) adds: *except Themistius.*

[22] Thus the Peripatetics are taken to view the assertoric as a statement-modality distinct from the statement-modalities of the possible and the necessary (although the matter at issue must be possible or necessary), while Alexander and his followers regard an assertoric premiss as one which is possible premiss *of a certain kind*, viz. which "exists in fact."

3. *Supporting Grounds of the Peripatetic View: I. The Matter Itself*[23]

|27:3| Among the strongest points which support the teaching of Theophrastus, |4| so far as concerns the matter itself, is [the fact] that an assertoric premiss, according to the teaching of Alexander, |5| does not assert universally, but only asserts by chance and for the least time.[24] |6| Examples of such premisses are not used in the art of rhetoric,[25] much less in the art |7| of disputation and the art of demonstration [i.e., are not used in any of the "syllogistic arts"].[26]

4. *Supporting Grounds of the Peripatetic View: II. The Precedent of Aristotle*

|27:8| One of their supporting-arguments from the standpoint of the discussions of Aristotle himself, is that he recommended |9| that the mixture [i.e., a modally mixed syllogism] of the possible with the absolute—I mean when the absolute is the major [premiss of a (modal) syllogism whose minor is possible]—|10|that such kinds[27] of absolutes are not to be used; I mean those which are imagined to be universal |11| at some indicated time, and for the least [period of time]. He (Aristotle) asserted that this species of mixtures |12| may yield a false conclusion, saying: "The demonstration of this is that it is necessary to avoid these kinds[28] |13| of absolutes, and to employ the absolute which is not limited [temporally]."[29]

The words of Aristotle |14| are as follows. He says: "It is necessary to take those premisses that assert universally and not in some limited time |15| like 'now' or some [other] limited time, but as absolute;[30] because in the case of |16| such premisses, [valid] syllogisms are made up, and because if the premisses are taken to assert at some limited time, |17| there will be no [valid] syllogism."[31] In saying these words he sets the [proper] limits for concluding the truths |18| in these mixtures [i.e., modally mixed syllogisms], and the limits for concluding falsity.

[23] It seems better, from the standpoint of the substance of the discussion, for the second section of the text to terminate here rather than at 27:1 above, as the MS indicates. Cp. footnote 16 above.

[24] See Section 7 below.

[25] The Latin reads: *et talibus propositionibus non uterent agricolae*!

[26] For the "syllogistic arts" see Steinschneider, *Al-Farabi*, pp. 17–18; and R. Walzer, *Greek into Arabic* (Oxford, 1962), pp. 130–135.

[27] Literally: *examples.* [28] Literally: *examples.*

[29] For Aristotle, a (first-figure) modal syllogism with an assertoric major and a possible minor validly yields an assertoric conclusion (*Anal. Pr.* 33b25–33). Under the indicated temporal construction of assertoric propositions, this principle becomes unviable.

[30] Supposing—with the support of the Latin— *m-t-l-qān* for *m-r-ṣ-lān*, as is required by the Greek.

[31] *Anal. Pr.* 34b7–12.

Thus an example which yields falsity is the argument: |19| "It is possible that every man move, and everything moving now is a horse, so it follows that |20| [it is possible that] every man is a horse."[32] But this conclusion is false. An example which yields truth is: |28:1| "It is possible that every man move, and everything moving now is a living-being (since it happens [accidentally] that nothing is moving |2| except the living), therefore every man is a living-being."[33] This conclusion is true.

This then is the strongest [position] which can be argued [by this first school] in these matters, |3| [both] from the discussions of Aristotle, and from the matter itself.

5. *Supporting Grounds of Alexander's View: I. The Matter Itself*

|28:4| As for the second school of thought [of Alexander and his adherents], they also argue on this subject [both] from the matter itself, |5| and from the discussions of Aristotle.

As regards the matter itself, they maintain that the intention here, |6| i.e., in *Prior Analytics*, is a discussion about the various aspects of syllogisms from the standpoint |7| corresponding to existence external to the intellect, and not from the standpoint of what is in the intellect only.[34] The absolute |8| according to the opinion of the first school of thought, I mean the opinion of Theophrastus, does not have existence |9| except in the intellect.[35]

Thus its status[36] [i.e., that of an absolute proposition] in regard to those [propositions] which possess a [superadded] modality, if that is attributed to it, is [like] the status |10| of a [quantitatively] indefinite [proposition] in its possession of a quantity-indicator, if that is attributed to it. Just as when an indefinite [proposition] is spoken of here [viz. by supplying a suitable quantity indicator] |11| its status is [like] the status of a particular [statement], similarly, it is necessary here to say that |12| the absolute has the status of a possible [proposition], but is not so delimited in the [explicit] statement.[37]

[32] Cp. *Anal. Pr.* 34b13–14.

[33] Note the unmodalized conclusion here. Cp. *Anal. Pr.* 34b14–19.

[34] Note again the basis for a distinction between modality *de dicto* and *de re*.

[35] Compare the report of Themistius given 26:9–11 above.

[36] The word I render as "status" in the present context would, in general, be more appropriately rendered as "force."

[37] The point is, that just as the quantitatively unlimited proposition "Dogs are terriers" is to be construed as particular ("*Some* dogs are terriers") rather than as universal ("*All* dogs are terriers"), so the absolute proposition "Dogs are terriers" is to be construed as of possible modality ("Dogs *may* be terriers") rather than of necessary modality ("Dogs *must* be terriers").

And similarly regarding the negative |13| absolute [proposition], it is necessary to say that it is not convertible; because if it is about a matter |14| in which this possible [modality] premiss is [properly] used, [then] it is not convertible; but if it were a necessary [proposition], |15| it would be convertible. Thus it is necessary in regard to this [i.e., a possible proposition] to say that it is not convertible; just as it was said in regard to [syllogisms] which |16| consists of two quantitatively indefinite [propositions] that they fail to yield [syllogistic conclusions], in the manner as with two particulars.[38]

Also there remains |17| to be dealt with by Aristotle one of the modes of the assertoric [premiss] whose rules he has not mentioned in respect of yielding a [syllogistic] conclusion, namely |18| the assertoric [propositions] [taken] external to the soul [as with this second school of thought].

6. *Supporting Grounds of Alexander's View: II. The Precedent of Aristotle*

|28:19| That is the strongest [argument] which they use as regards the matter itself. |20| And as regards Aristotle himself,[39] Aristotle frequently changes, in an "opposing" syllogism, |29:1| a possible premiss into an assertoric one [of suitable kind].[40] This indicates that it [the possible premiss] is assertoric |2| in fact.

Abū Naṣr [al-Fārābī] inclines to the teaching of Alexander. And as to Avicenna, |3| he has with respect to this, a teaching differing from all this. We shall discuss it later.

7. *Averroes' Resolution of the Dispute*

|29:4| Now that these doubts have been set down, we say: That it is self-evident knowledge |5| that a universal proposition is one whose predicate is found in *all* of its subject. And [we say] that |6| this [inclusion] can be in two ways. One of them is that the predicate is *actually* found in all of the subject; and the second |7| that it is not *actually* found in all of the subject, but [only] *in possibility*[41]—I mean in future time.

|8| And [we say] that among those [universal propositions] in which

[38] That is, Alexander's assimilation of assertoric propositions (as a proposition possible in a certain way, rather than necessary) to quantitatively indefinite propositions (as propositions particular in a certain way, rather than universal) successfully serves to account for several of their more important logical features.

[39] I suppose *f-'inn* for the *f-la-nn* of the printed text.

[40] For an analysis of "opposing" syllogisms see N. Rescher, *Al-Farabī's Short Commentary on Aristotle's "Prior Analytics"* (Pittsburgh, 1963).

[41] The Latin reads: *non insit toti subjecto in actu, nisi possibiliter.*

the predicate is actually found in all of the subject are: (A) those whose predicate |9| is present in it [i.e., the subject] always [i.e., at every time], and this is the necessary [proposition]; and (B) those in which this is [the case sometimes but] not always, and this is the assertoric [proposition]. |10| And [we say] that the [propositions which are the case] not always are of two kinds: (B1) the kind in which one finds the predicate in all of the subject *most of the time*,[42] |11| and (B2) the kind in which it [the predicate] is found [in the subject] not most of the time, but in *the lesser or an equal period* [*of time*]. Thus the assertoric propositions are of |12| these three kinds, [those which obtain] mostly, leastly, or equally of the two [times].[43]

And this resembles the state |13| of the possible [propositions], I mean that it [the predicate] is found in them mostly, leastly, or equally. But |14| these three groups occur in the case of possibility from the standpoint of the subject, I mean that it has the predicate[44] |15| mostly or leastly or equally.[45] But the assertoric [propositions] occur from the standpoint of time.[46]

|16| It is clear that the mostly-assertoric [propositions], I mean those which are [actual] for the most time, are sometimes |17| possible for the least time,[47] and this [even] at a point-of-time at which the predicate is not found |18| in fact in all of the subject, and it is [possible for] the least time.

[42] Before continuing essentially as here, the Latin interpolates a long sentence of explanation.

[43] The theoretical possibilities are that the predicate P can belong to the subject S in (i) at all times; (ii) mostly, but not always; (iii) just as often than not; (iv) sometimes, but less often than not, and (v) never. The proposition "All S is P" taken *as necessary* corresponds to case (i) alone, and is to be construed as: "At all times t, all the S's-at-time-t are P's-at-time-t." But when taken *as assertoric*, the proposition corresponds to cases (ii)–(iv). (For instance, the mostly-assertoric is, "For most times t, all the S's-at-time-t are P's-at-time-t.") Thus the assertoric modality is given three distinct sub-modes.

[44] I suppose *al-ḥaml* for the *al-ḥamd* of the printed text.

[45] Time aside (or, if one prefers, at any particular *given* time), there are three theoretical possibilities—the predicate P can belong to (i) all, or (ii) the majority, or (iii) an equal number, or (iv) the minority, or (v) none of the (instances of) the subject S. The proposition "All S is *actually* P" is appropriate in case (i), and "All S is possibly P" is appropriate in cases (ii)–(iv).

[46] As indicated in the preceding paragraph. Returning to the analysis given in our Introduction, one sees that Averroes apts for the "Non-temporal Construction" of the modality of possibility.

[47] Given the mostly-assertoric "At most times t: All S's-at-time-t are P's-at-time-t" we can infer the (temporal unqualified) proposition "All S's are possibly P's" since we know that, at the very least, "A minority of the S's are P's," (which is the leastly-possible case). Having just insisted in the preceding paragraph that possibles are to be quantified with respect to the subject rather than with respect to time, it seems inconsistent at worst, and careless at best, for Averroes to quantify them temporally in this and the succeeding paragraph.

As for the leastly-assertoric, |19| I mean those [propositions] in which the predicate is found in all of the subject for the least time, it is clear that they are [propositions] possible |20| for the most time, if the possible [proposition] is that whose predicate is *not* found in all of its subject |21| in fact.[48] And if [the case] be of this kind, then the possible [proposition] which is possible for the most time, |30:1| I mean that in which the predicate is found in all of the subject in fact for the most time, is |2| the possible [proposition] which, when transformed to an assertoric, will be a leastly-assertoric.[49] And this [leastly-assertoric] is not usable |3| in the sciences.

As for [the contradictory of!][50] that [proposition] which is a possible for the least time, and [the proposition] actual for the most time, |4| I mean where the predicate is found in all of the subject for the most time, it is clear that this is usable |5| in the sciences.[51]

8. *The Position of Al-Farabī*

|30:6| Abū Naṣr [al-Fārābī] has explained about this [problem] in his [*Great?*] *Commentary on "Posterior Analytics,"* saying that |7| the non-necessary [propositions] are of two kinds: either those actual for the most time, or those actual for most |8| of the subject; or those which join these two things. [And he says that,] as for the leastly-actual [proposition], and the equal, |9| these are two [conceivable] sorts only —the sciences do not inquire into them. But as for the other two sorts [viz. the two types of mostly-actuals], |10| they [i.e., the sciences] do inquire into them.

In this [last-named] kind of premisses, the premisses are put into [the modality of] necessity, |11| but they are not [strictly speaking true] by necessity; for example "Every raven is black" and "Every snow is white." Of this sort |12| are the premisses which Abū Naṣr [al-Farabī] calls "akin to the perfectly certain." These are [assertions] which no |13| sense-experience[52] is found to contradict, and no [true] statement

[48] If "All S is P" is a leastly-actual, i.e., given "For fewer times t than not: All S's-at-t are P's-at-t," then "No S is P" is a mostly-possible, i.e., "The majority of S's are not P's."

[49] Given the mostly-possible "All S is possibly P (in that most S is P)" we can infer at least the corresponding leastly-actual, viz. "For fewer times t than not: All S's-at-t are P's-at-t."

[50] Without this amendment the thesis would not make sense.

[51] Both of these cases represent mostly-actuals, with respect to which "Most S's are P's" can be asserted unqualifiedly. This then puts us within the framework of scientific knowledge which, on Aristotle's epistemology, can deal only with that which obtains always or mostly.

[52] Supposing *ḥ-s-s* for *j-n-s*, with the support of the Latin (*quibus nullus sensus contradicit*).

[whatsoever]. For the premisses which are truly necessary are those |14| in which the intellect apprehends the essential relationship between the predicate and the subject.[53]

As to [the case] when |15| the intellect does not apprehend this [essential] relationship, this is when possibility enters into it [i.e., the proposition in question]. |16| And if possibility enters into it [i.e., the proposition], it is [merely] assertoric, and not necessary. These [quasi-necessary] premisses |17| are frequently also ones which enter into the sciences in[54] syllogisms. As Aristotle says, they are composed |18| of these; he said this because the essential [relationship] is very rare.[55]

9. *Aristotle's Position as Conceived by Averroes*

|30:19| And for this reason Aristotle said in *Posterior Analytics* that every necessary [proposition] |20| is so essentially, because that which is not so essentially is *ipso facto* assertoric, since it is possible for the predicate not to be found |31:1| in it for all of the subject at some point of time.[56] If the matter is thus, then the [mode] of assertoric [proposition] |2| which Aristotle wanted (intended) [here] is not the leastly [assertoric]—as people have supposed, following Alexander [of Aphrodisias]—but rather he wanted (intended) |3| the mostly [assertoric], or both of these together;[57] unless he wanted (intended) the mostly [assertoric] in the first place, and that other [leastly assertoric] |4| in the second place, from the standpoint that it is usable in certain cases, such as its usefulness in an "opposing" syllogism |5| when one transforms the possible for the most time into it [viz. a leastly-assertoric].[58]

But Aristotle only used |6| this leastly [assertoric] in the transforma-

[53] Thus these propositions are "necessary" not in the strong sense in which "Every man is rational" is necessary (viz. that the predicate is included in the very essence of the subject by definition), but in the weaker sense in which "Every raven is black" is necessary (viz. that there is an "essential relationship" between the predicate and the subject).

[54] I suppose *bi* in place of *bal.*

[55] As here reported by Averroes, al-Farabi's position is essentially as follows: The proposition "All S is P" is *necessary* if it holds for all S's and all times, and *assertoric* if it holds only for most S's (or at most times). However certain universal propositions (e.g. "All ravens are black") are treated as *necessary by courtesy*, because even though there is no certainty from the essence of the things that all ravens one must at all times be black, a sufficiently close "relationship" has been established between the essences involved.

[56] See *Anal. Post.* 74b5–13, 75a27–31, etc.

[57] If, along the lines of the preceding sentence, we class the proposition "All S is P" as of assertoric modality if it is *possible that some S not be P*, then *this* possibility should not be the leastly possible "Only a minority of the S are not P," for then *most S would be actually be P*, so as to warrant the mostly-case.

[58] Compare 28:20–29:1 above.

tion because there is no difference in certain cases between it [viz. the leastly-assertoric] in its yielding a conclusion |7| and between that of the mostly [assertoric]. This [occurs] when the premisses which are connected with it [viz. the leastly assertoric proposition] in these cases |8| are impossible; perhaps he [Aristotle] excluded the connection with a possible [premiss]—I mean when the possible [premiss] |9| is the minor—because that [syllogism] which is composed of them is then [thereby] of the kind that does not yield a conclusion.[59]

Thus Aristotle mixed (combined) the matter [i.e., the treatment of modal syllogisms] |10| in the different kinds of absolutes [i.e., absolute-propositions], just as he mixed (combined) the matter in the species of possibles [i.e., possible-propositions]. I mean that he did not differentiate |11| in this book [the *Prior Analytics*] the mostlys from the leastlys. We have already discussed the reasons for this in |12| our *Middle Commentary* on this book.[60]

10. *Continuation of the Preceding*

|31:13| It is evident that the two kinds of premisses—I mean the mostly-assertoric and the leastly-assertoric—|14| are transformable from a possible [proposition]; but the mostly-assertoric [proposition] is transformable from one which |15| is possible for the most time. Thus either it is the case that Alexander [of Aphrodisias] missed this sense |16| which we have discussed regarding the matter of the absolute [proposition], or it is the case that people missed this in |17| the discourses of Alexander, and wronged him, and thought that he intended the meaning of the lesser-absolute, since |18| the people did not accept other than it. This is more suitable and more probable.

However that may be, |19| this is what it is necessary [as a basis] to work on, and to explain by means of it the teaching of Aristotle about the absolute [proposition]. |20| For it is the teaching from which all the previous doubts relating to both [of the parties] are [now] removed, |32:1| and at the same time a matter true of itself and to be known through what the ancients knew of it.

How strong is |2| the agreement of the teaching of Aristotle to truth, and how the people are removed from understanding him in many |3| matters which are self-evident, let alone those known otherwise! "God gives His grace |4| to whomever He pleases."

[59] It is not possible to construe the meaning of this discussion without a good deal of interpretation. On my proposed rendering the principal point is that a syllogism that has a leastly assertoric major and a possible minor cannot validly yield a conclusion.

[60] See chapter 13 of Averroes' *Middle Commentary* on Book I of *Anal. Pr.*

11. *Avicenna's Position*

|32:5| As for Avicenna, he is very confused in this matter. The gist |6| of what he says about this that a necessary attribution can, in his view, occur in premisses in |7| five ways:

(1) Firstly, that the predicate pertains to the subject at all times[61] necessarily |8| and absolutely, i.e., without ever ceasing. Examples are the statements: "God is true," and "The heavenly sphere has a circular movement" |9| (according to those who think that it is eternal).

(2) Secondly, that the predicate pertains |10| of necessity to every instance of the subject so long as (whenever) the essence of the subject exists [in this instance]. An example is the statement: "Every |11| man is by necessity an animal."

(3) Thirdly, that the predicate pertains to the subject |12| by necessity so long as the subject is characterized by it [i.e., by the predicate]. An example is the statement: "Everything white is necessarily colored, |13| so long as it is characterized by color."[62]

(4) Fourthly, that the predicate pertains to the subject by necessity |14| at certain times; and this either without [temporal] limits—e.g. the statement "Every man dies"—|15| or with a [temporal] limit, e.g. the statement "The moon will be eclipsed tomorrow."

(5) Fifthly, that the predicate pertains to the subject by necessity at certain times so long as the predicate pertains to it [i.e., the subject].[63]

He (Avicenna) says: "Some people |16| say that the [absolute] proposition is that which contains no conditioning modality at all, neither necessity nor |17| possibility. But it is or it can be one of these five [modes of] necessity, and sometimes it is or it may be possible." |18| He [further] says: "Some of them [i.e., people] say that the absolute consists of the last three modes [above], without the first two, |19| and that the necessary consists of the first two." He means thereby, I suppose, Alexander [of Aphrodisias] |20| and those who speak by his words [i.e., those who accept his views]. He (Avicenna) says: "He [Alexander, presumably] simply says that the absolute [proposition] is that whose predicate |33:1| pertains to the subject so long as (whenever) the predicate is to be found [in the subject], which is foolishness." That is what he says in the *Kitab* |2| *al-shifa'*. As to [what he says] in the *Kitab*

[61] The editor states that the word in question is indecipherable in the MS. The Latin has: *semper*. In correspondence Prof. Dunlop writes that the missing word is quite likely *yakunu*.

[62] I suppose *'-b-y-d* for *y-t-ṣ-f*.

[63] Note that (5), in effect, *combines* (3) and (4).

al-najat, he puts the absolute assertion into four [senses] |3|—namely into the three which he mentioned here [viz., in the *Shifa'*],[64] and into this [other] sense which he makes fun of here [in the *Shifa'*], |4| attributing this opinion to Alexander.

12. *Criticism of Avicenna's Position*

|33:5| But all this is confusion and disorder. This is so because necessary universal premisses |6| do not require these conditions [specified by Avicenna]. This is because [when we say] "Man is necessarily an animal," |7| this predication never ceases to be so, equally whether every single man either exists |8| necessarily and always, or not. The universals are existent [i.e., do not come into existence] and not perishable, I mean |9| those of which a [true] universal judgment is composed, like the statement: "Man is an animal."

The condition[s] which |10| he (Avicenna) mentions are only required in *particular* propositions. And so this is what escapes one |11| who thinks that he cannot attain necessary knowledge in matters universal yet perishable! Likewise, |12| there is no difference in an attribution of necessity between the statement "Man is necessarily an animal" and the statement |13| "Men [i.e., some men] are necessarily white." There is also no need in this case for the condition[s] which he mentions |14| unless one takes a particular proposition.

As for what he says of temporal necessity |15| he speaks truth, because it is indeed one of the species of necessity. Its (essential) characteristics in predication |16| and in conversion are [the same as] the (essential) characteristics of [absolute] necessity. But this is not to say that this is what Alexander [of Aphrodisias] intended |17| by the absolute [proposition], since Alexander intended by the absolute [proposition] a third sort, wholly apart from the necessary and the possible.[65]

|18| The man [i.e., Avicenna] is only imagining, according to my reckoning, in what he thinks in these sections, seeing that |19| people define necessity by [the requirement] that it is always and without ever ceasing. And they say that the absolute |20| occurs when a thing exists in a subject so long as (whenever) the subject [itself] exists; |34:1| either essentially if it [i.e., the predicate] exists other than in the subject, or actually exists |2| in the subject.

13. *Continuation of the Preceding*

|34:3| They [i.e., certain people] say that the word "necessary" is used equivocally in this sense[66] |4| and in that of the absolute. Thus the

[64] Viz. (3)–(5) above, as per 32:15–19.

[65] See 28:9–12 above.

[66] Presumably that of 33: 14 ff.

man [viz. Avicenna] thinks that what is said in the sections about the absolute assertion is [the same as in] the chapters about |5| universal and necessary propositions. [Therefore] he makes the first definition of the necessary[67] pertain to those [propositions] which are always |6| particular. This definition [of Avicenna's] embraces the several species of the necessary [proposition] existing at all times, |7| whether necessary in a particular case or in being universal. For the definition of the nature of the necessary |8| and [that] of the absolute and of the possible are [in fact] distinct from the definition of a necessary universal proposition and [also] distinct from the definition of |9| an absolute universal proposition, and likewise for the possible universal proposition. Thus here, on my reckoning, |10| confusion overcomes this man [viz. Avicenna]. "God grants success to the truthful."

[67] See 32:7 ff. above.

INDEX

This index registers ancient and medieval writers only. It omits *Aristotle*, of whom direct or indirect mention occurs on virtually every page. In the alphabetic ordering of Arabic names, the prefixes *al-*, *ibn*, and *abu* have been ignored.

ibn 'Abdun (Muḥammad), 16
Abelard (Peter), 45, 52
Abentomlus. See ibn Ṭumlus
al-Abharī, 18, 20, 66, 77
al-Akhdarī, 20
Alexander of Aphrodisias, 28, 35, 71, 95–104
Ammonius, 44, 51
Andronicus (of Rhodes), 23, 24
al-Anṣarī (abu Zaid), 69
al-Ansarī (Zakariyya'), 66
Anselm (St.), 39, 52
Aquinas (St. Thomas), 45, 52
Averroes, 17, 40, 41, 45, 52, 87–90, 91–105
Avicenna, 16, 17, 20, 25, 40, 41, 58, 76–86, 98, 103–5

al-Baihaqī (Ẓahīr al-Dīn), 56
ibn Bajjah, 17
Bar Hebraeus, 56
abu Bishr Mattā ibn Yunus, 14, 15, 24–6, 82
Boethius, 44, 51, 77, 82

Callimachus, 79
Chrysippus, 77
Cicero, 51

al-Darimī (abū-'l-Hasan), 87
Diodorus Cronus, 79–82
Duns Scotus, 45

Epicureans, 44
Eudemus, 77, 92, 95

al-Farabī (abu Nasr), 14, 15, 17, 19, 20, 21–7, 29, 39–42, 45, 50, 52, 55, 82, 83, 88, 90, 94, 98, 100, 101

Galen, 16, 58
George, Bishop of the Arabs, 27
al-Ghazawī (Khair-al-Dīn), 66
al-Ghazzali, 55

ibn Hailan (Yuhanna), 24, 25
ibn Hazm, 87
Hunain ibn Isḥaq, 14, 15, 26, 29, 31

Ishaq ibn Ḥunain, 50

John of Damascus (St.), 26, 55, 57
al-Jurjanī ('Alī ibn Muhammad), 18

al-Kātibī. See al-Qazwīnī
ibn Khaldun, 18
ibn al-Khammār. See ibn Suwar
al-Khunajī, 17
al-Khwārizmī (Muhammad ibn Aḥmad), 14, 33, 64–75
al-Kindī (Ya'qub ibn Ishaq), 14, 28–38, 55, 66, 82

Maimonides (Moses), 56, 90
al-Marwazī (Ibrahīm), 24, 25
al-Marwazī (abu Yahyā), 25
ibn Mubarakshah, 18
ibn al-Muqaffa' (Muhammad ibn 'Abd-Allah), 29, 66

ibn Nā'imah ('Abd-al-Masīh), 29

Ockham (William of), 45, 52, 94

Porphyry, 13, 26, 28, 31

al-Qazwīnī (al-Kātibī), 18, 20, 94
Quwairī (abū Ishāq), 24

al-Razī (Fakhr-al-Dīn), 17
ibn Rushd. See Averroes

al-Ṣabī' (abu Sa'īd), 30
ibn Sab'īn, 17
abu-'l-Ṣalt, 17, 20, 87–90
School of Baghdad, 15–17, 26
ibn Sīna (abu 'Alī). See Avicenna
Stoics, 44, 76–86, 94
ibn Suwar (abū-'l-Khair), 57

al-Tahtanī, 18
ibn al-Ṭayyib, 15, 56, 57
Tertullian, 55
Themistius, 15, 94, 95, 97
Theodore abu Kurrah, 57
Theophrastus, 23, 77, 92–7
ibn Ṭumlus, 17, 20
al-Ṭusī (Nasir-al-Dīn), 18
al-Tustarī, 18

al-Urmawī, 17
ibn abī Uṣaibi'ah, 22

Yahya ibn 'Adī, 14, 15, 56, 57
al-Ya'qubī (ibn Waḍih), 32
ibn Yūnus (Kamāl-al-Dīn), 18

ibn Zuhr, 87
ibn Zur'ah ('Īsa), 15, 56–63